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The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

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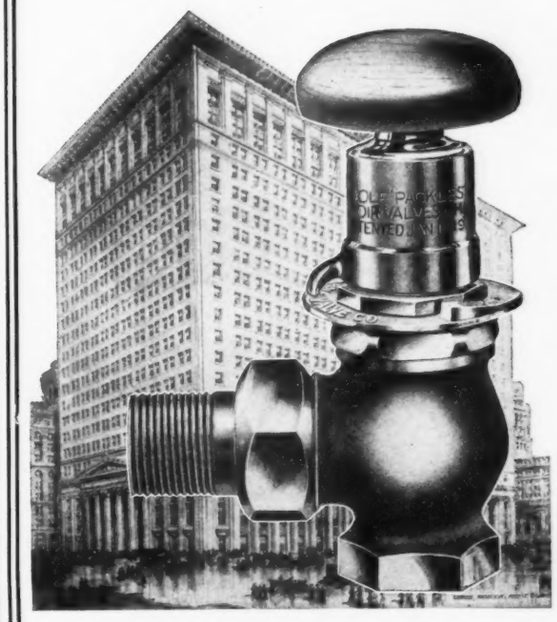

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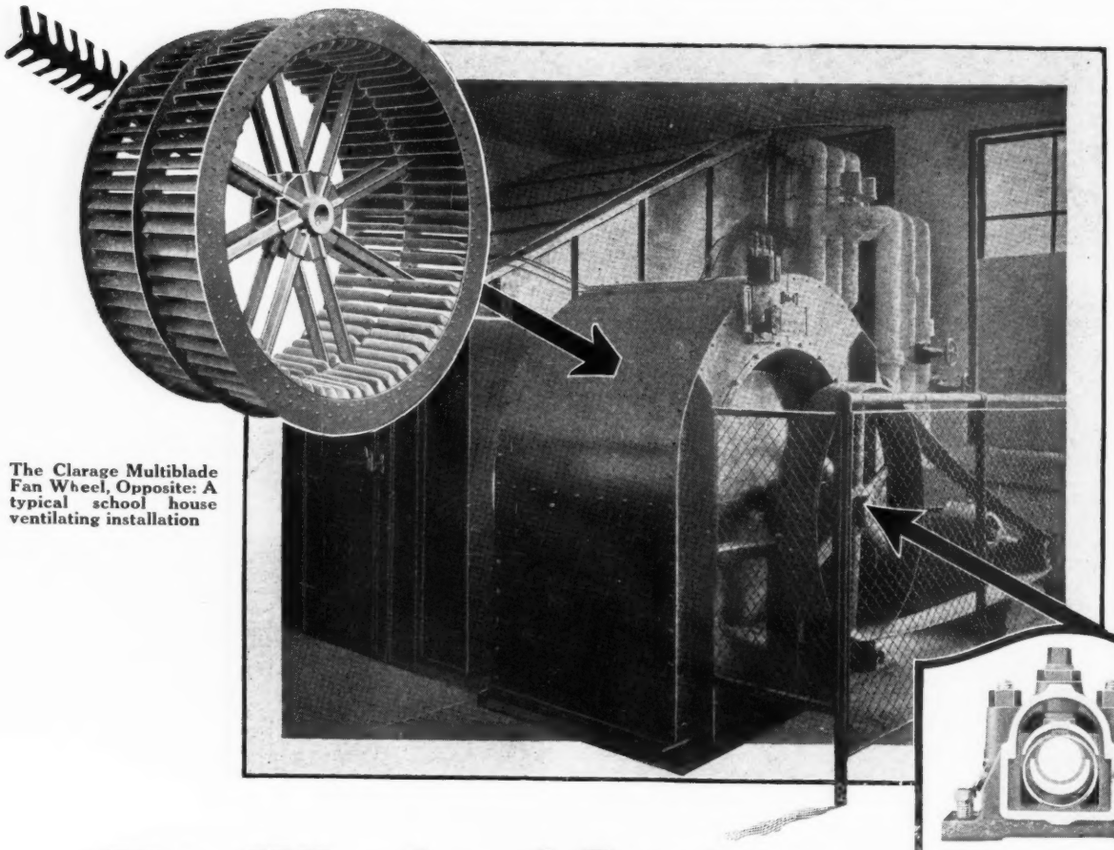

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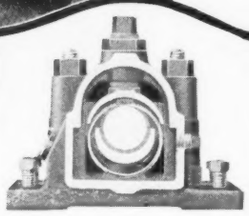
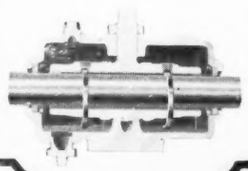


Above: Section through oil ring of the Clarage bearing. Note set screws and large through bolts to securely hold bearing when adjustment is completed.
Below: Longitudinal section showing self-aligning sleeve, oil rings, and large oil reservoir, and felt washers.



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The Heating and Ventilating Magazine

Vol. XX No. 11

Contents for November, 1923

Aerology for Amateurs and Others.....*E. Vernon Hill* 39
VIII-Dust.

Remodeling the Heating and Ventilating System in Independence Hall.
Changes Found Necessary in This Famous Group of Buildings, with Details of the Work of Installation.

The Cooling of Air.....*J. Roger Preston* 47
A Plain Exposition of the Subject That Is Having a Wide Application in Engineering Work.

Locating Leaks in Underground Pipe Lines with the Geophone..... 50

The Advent of the Copper Air Heater..... 53
Aerofin, the New Non-Corrosive Air Heater.
New Type of Low-Pressure Copper-Tube Heater.

New Books 56
The New Kent.
Calculations in Heating and Ventilation.
Standard Costs for Sheet-Metal Workers.

Cooling of Electric Generating Equipment and Central Station Buildings..... 57

Annual Convention of American Gas Association..... 59

Precautions To Be Taken in the Use of Fans with Gravity Warm-Air Furnace Heating Systems 59

First Annual Meeting of American Construction Council..... 59

Group Heating as the Next Forward Step in the Progress of the Art
H. C. Kimbrough 60

Government Inaugurates New Smoke Abatement Campaign..... 62

Legal Decisions 63
Evidence That Heating Plant Installed Under the Contract with Owner Rather Than Tenant.
Rates for Steam Heat and Hot Water Service.
Reasonableness of Steam Heating Rates.
Subcontractor Cannot Enforce Lien Under Kansas Statute for Heating Plant Substantially Different from That Required by Contract with Owner.

Correspondence 64
A Warm-Air Furnace Heating Problem.
Comments of a Canadian on Present-Day House-Heating Methods.

Development of the Reversible Fan Housing..... 65

Offer of American Manufacturing Rights of Ozonair..... 66

American Society of Heating and Ventilating Engineers..... 67
New Officers for Illinois Chapter.
New York Chapter Holds "Good-Fellowship" Meeting.
Western New York Chapter.
St. Louis Chapter Adopts a Slogan.
The Journal To Be Published Monthly.

Portable Unit Fan Blast Heaters..... 68
No. 10—Sirocco Unit System of Heating.

National Trade Extension Bureau..... 69
Heat Regulation Publicity Suggestions.

Outlook Grows Brighter.....*L. W. Alwyn-Schmidt* 75
Finding of Right Goods for Market is Leading Problem—Reduction of Overhead Charges is Advisable.

Standard Heating and Ventilating Data Sheets..... 78
No. 6-I—Portable Unit Ventilators—The Heatovent.
No. 6-J—Portable Unit Ventilators—The Heatovent (Continued).
No. 6-K—Portable Unit Ventilators—The Heatovent (Continued).
No. 6-L—Portable Unit Ventilators—The Heatovent (Concluded).

Engineers' Specification Index, Page 116.

Advertisers' Index, Page 122.

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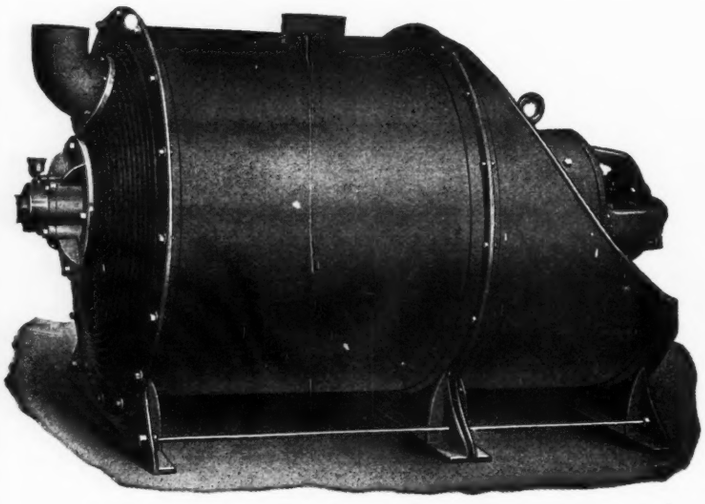

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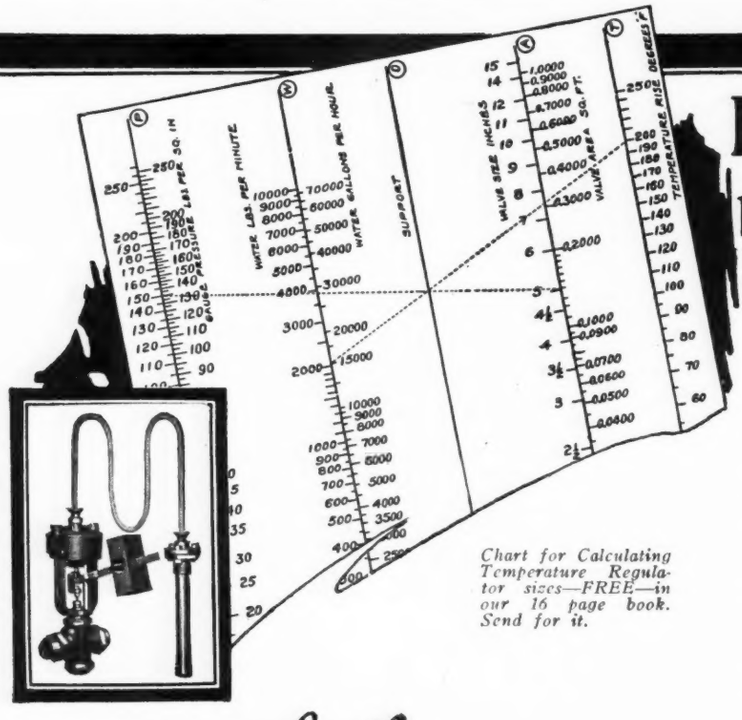

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The Heating and Ventilating Magazine

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NOVEMBER, 1923

Aerology for Amateurs and Others

The Evolution of Modern Ventilation and its Effect on Present and Future Practice

BY E. VERNON HILL

Previous articles in this series are as follows: January, 1923, Historical Sketch; February, 1923, Health and Comfort Factors; March, 1923, The Manufacture and Use of Thermometers; April, 1923, Test Methods; May, 1923, Air Dust; September, 1923, Classification of Test Methods for Dust Determinations; October, 1923, Discussion of Test Methods for Dust Determinations.

VIII—Odors

DUE recognition is not always given to the importance of odors in ventilation problems, the general viewpoint being that objectionable odors are a side issue, as it were, objectionable, perhaps, from an aesthetic standpoint, but having no direct affect on the health of the persons subjected to their influence and no particular bearing on the design and operation of the ventilating equipment.

Some years ago, while the writer was in charge of the ventilation division of the Chicago Health Department, the subject of odors in connection with ventilation practice was analyzed. The Complaint Clerk was requested to withdraw from the files 100 current ventilation complaints received during the preceding month. These complaints came from schools, factories, restaurants, office buildings, apartment buildings, in fact, from practically every source, and represented all types of occupancy and of ventilating equipment.

The complaints read, "Poor or inadequate ventilation," "Air foul," "No fresh air," etc., and usually gave no indication of the actual cause of the trouble.

The 100 complaints selected from the files had all been investigated and with the exception of seven, the real difficulty located. A tabulation of the analysis follows:

Routine ventilation complaints	100
Complaints due to odors	43
High temperature or high humidity, or both	28
Low temperature or objectionable drafts	17
Dust	4
Smoke	1
No apparent cause for complaint	7
Total	100

Of the 43 complaints due directly or indirectly to objectionable odors, 16 could be directly attributed to odors from restaurant kitchens entering the dining room, or adjoining buildings, odors from refuse or other objectionable material in the neighborhood of the fresh-air intake, odors from accumulations in supply ducts or other parts of the equipment and to similar causes. 27 of the 43 were attributable to body odors in the places under investigation, such as theatres, schools, factories, etc., where the air supply was deficient, or improperly distributed, or where an excessive temperature or humidity accentuated conditions due to this cause.

It can readily be seen from the foregoing that the subject of odors is one that cannot be ignored, as it is, according to this analysis, the most important single factor that causes dissatisfaction with the ventilating equipment. Furthermore, the popular belief that odors have an aesthetic bearing only on our comfort and well being is not an entirely safe hypothesis.

EFFECT OF ODORS ON CONVALESCENT PATIENTS

The late Dr. Henry B. Favill, a recognized authority on therapeutics, frequently called the attention of his students to the decidedly harmful effects on convalescent patients of bad aesthetic environment.

The flat dweller, recovering from debilitating diseases, who is forced by circumstances to sit, for example, on a rear porch, with the depressing view of littered back yards and dirty alleys, and the objectionable odors eminating therefrom, has a much poorer chance of recovery than a person likewise afflicted who has an opportunity to recuperate in the country, or in more pleasing outdoor surroundings.

The harmful physiological effect of objectionable con-

ditions that affect any of the senses is well recognized by the experienced physician. It is not entirely clear, furthermore, that objectionable odors may not have a direct harmful influence.

HOW ODORS INFLUENCE BLOOD SUPPLY TO BRAIN

It has been suggested, according to Howell, that the circulation of the brain is affected by odors, either pleasant or objectionable. Shields made some experiments on the vascular supply to the skin of the arm by means of the plethysmograph and noted that odors caused a constriction of the blood vessels in the skin, which is usually interpreted as meaning an increased flow of blood to the brain.

Apparently Shield's observations made no distinction between the effect of odors that were pleasant, or those that were objectionable. The fact remains, however, that odors in all probabilities, do affect the blood supply to the brain and to other parts of the body.

At the present state of our knowledge, it is impossible to say to what extent harm may result.

SENSE OF SMELL AS DEVELOPED IN HUMANS

The sense of smell is located in the upper part of the nasal cavity and covers a small area about 250 square millimeters in either nostril, partly on the nasal septum and partly on the upper turbinate bone. Odorous substances to be perceived must be in gaseous form. They are brought into contact with this small area in breathing, or by the process of sniffing. The gas enters into solution on the moist surface of the olfactory membrane and acts chemically on the sensitive hairs of the sense cells.

It is assumed that there are certain groups called odoriphore groups which are characteristic of all odorous substances and Haycraft has formulated certain fundamental conceptions tending to show that odorous properties are periodic functions of the atomic weight, in accordance with Mendelejeff's Periodic Law.

CLASSIFICATION OF ODORS

Odor perceptions have not yet been ultimately classified as have taste perceptions into a few distinctive groups. Zwaardemaker's classification is conceded to be the best to date. He classifies odors under nine headings as follows:

1.—Aetherial odors, such as given off by fruits.
2.—Aromatic odors, such as camphor, citron and resinous substances.
3.—Fragrant odors as of flowers and perfumes.
4.—Ambrosial odors typified by amber, musk and bodily odors.
5.—Garlic odors, as found in the onion, garlic, sulphur and some other inorganic substances.
6.—Burning odors, such as roasted coffee, tobacco smoke, benzol, phenol, etc.
7.—Goat odors, typified by the characteristic odor of this animal, by caproic, or caprylic acid found in the sweat, etc.
8.—Repulsive odors, given off by many narcotic plants or acanthus.
9.—Nauseous odors, or fetid odors from certain plants and from the products of putrefaction.

All odors can be placed in some one of the foregoing subdivisions and probably future investigation will reduce this number to a few fundamental groups.

MEASURING ODOR PERCEPTIONS

Zwaardemaker devised an instrument called the Olfactometer which he used in determining the acuteness of olfactory perception for different individuals.

It consists of a cylinder, the surface of which is lined with porous material which is saturated with an odorous solution (Fig. 27) and a movable inside tube graduated in centimeters. A convenient shield with a handle is provided between the olfactory tube and the end of the inner tube, which is applied to the nose.

In using the instrument, air is drawn through by inspiration, the inner tube is withdrawn a certain distance —the greater the distance, the greater the odorous surface of the outer tube that is exposed to the air passing through and the stronger the odor at the nasal tip.

It is highly desirable in routine test work to be able to measure with some degree of accuracy the strength of odorous substances present in the air as the importance of this factor is recognized and as comparative information is essential for filling in the Synthetic Air Chart and arriving at percentages of perfect ventilation. On this chart odor perceptions are recorded as a percentage of freedom from odors, 100% being perfect.

The writer originally adopted a modification of Zwaardemaker's Olfactometer, made of metal instead of glass, with a double nasal outlet, with rubber tips accurately fitting each nostril. However, the difficulty

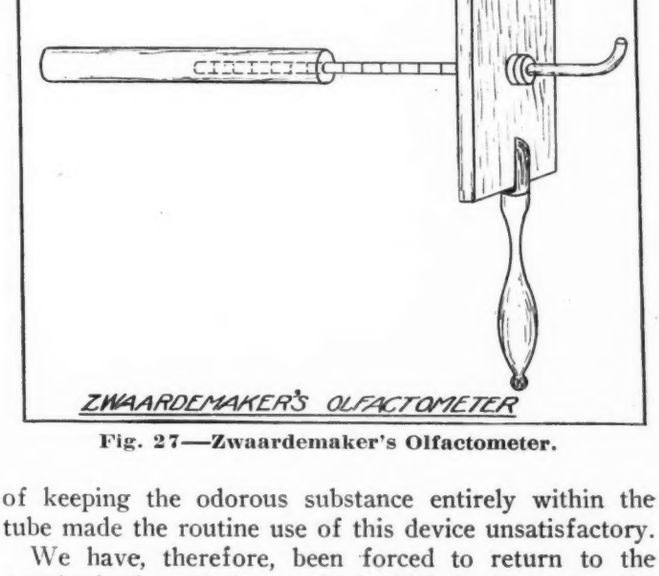

Fig. 27—Zwaardemaker's Olfactometer.

of keeping the odorous substance entirely within the tube made the routine use of this device unsatisfactory.

We have, therefore, been forced to return to the standard odor solution method which is the most satisfactory procedure that has been devised up to the present time.

The Odorometer (Fig. 28) consists of a leather case containing six vials of odor solutions. The strength of the solution in each vial is graduated from Very Strong (75%) to Decided (80%), Distinct (85%), Noticeable (90%), Faint (95%) and Free From Odors (100%).

In the stopper of each vial a glass rod is affixed. In

using the instrument, the stopper is removed from the vial and the rod waived gently to and fro about 1 in. from the nose, much as a perfume salesman demonstrates his wares.

In making determinations of percentage of odors in a room, the observer proceeds as follows:

Immediately upon entering the room he sniffs the air to determine the strength, not the character, of the odors present. He then selects the vial which he thinks will come nearest to the strength of the odor observed in the room, removes the stopper and waives the glass rod

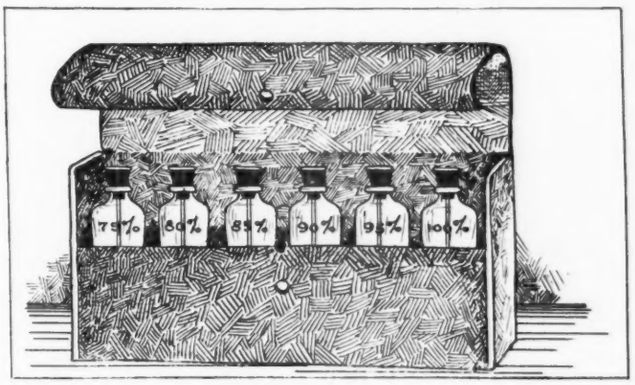

Fig. 28—The Odorometer.

about 1 in. before the nose. If this vial is too strong, or not strong enough, he selects others until he finds one that in his judgment comes the closest to the strength of the room odor. If the room odor appears to fall between the strength of two vials, a careful observer may interpolate ot get more accurate results, although graduations of 5% will answer all ordinary purposes.

In making up the solutions, the following method should be employed:

Secure from a druggist a fresh bottle of butyric acid (Merck). Be sure the acid is fresh and has not been opened. A small 1-oz. bottle of butyric acid costs about 30¢.

Next provide six clean test tubes of not less than 25-c. c. capacity and place in each 10 c. c. of distilled water. Into the first tube add five drops of butyric acid, four drops into the second tube, three drops into the third tube, etc., none in the last tube. The first tube will be the 75% solution, the last tube, which contains no butyric acid, will be the 100% solution.

After the acid has been added to the water in the tubes, 1 c. c. of glycerine should then be added to each. Great care must be exercised in using the Odorometer to prevent the contents of the vials from being spilled on the case or on the outside of the bottles.

Not more than one vial should ever be opened at one time and interchange of stoppers should never be made as the difference in the strength of the various solutions must be carefully maintained.

This method of determining the strength of odors in a room must not be considered as an exact determination, but it is a very material aid in arriving at more accurate information than any other method. It is surprising, also, how close different observers will measure the odor content of a room with this method.

(To be Continued)

The Radiating Values of Colors

By T. W. Reynolds

When radiant heat falls on a body part of it is reflected from the surface, another part is absorbed and transformed into sensible heat, increasing the temperature of the body, and the remainder is transmitted through the body and has no effect on the temperature. Both heat and light (radiant energy) follow the same physical laws, so what is said herein concerning light pertains also to heat. Likewise, reflecting values given in a table will serve as a guide to radiating values, as good radiators and absorbers are bad reflectors, and vice versa.

WHY WARM-AIR PIPES LOSE MORE HEAT BY COVERING THAN IF LEFT BARE

Radiating and absorbing powers are equal and increase with the temperature. They are also greater for rough or dark-colored surfaces than for smooth or light-colored ones, lampblack being the best radiator of heat, brass or silver (polished) the best reflectors. So we find that water boils sooner in a kettle covered with soot than in one brightly polished and that bare bright tin pipes of a warm-air system lose less heat than when covered with asbestos paper in any number of thicknesses not over seven, as shown in Table 1.

Table 1 also shows that though dust decreases the heat loss from warm-air pipes of tin when bare, it increases the loss from such pipes when insulated, that rusty surfaces are better radiators than bright surfaces, that painted surfaces of dark color are better radiators than those of light color, and that dark colors add much more to the heat lost from pipes without insulation than they add to the loss from insulated pipes.

DARK SURFACES HAVE SUPERIOR RADIATING VALUES

Tables 2 and 3 also demonstrate the superior radiating value of a dark surface for finishing coats. The author adds that paints presenting a high gloss are, moreover, less absorptive of thermal rays than those present-

TABLE 1—EMISSIVITY OF HEAT FROM TIN WITH VARIOUS SURFACES.

B. T. U. per Square Foot per Hour per Degree Difference and Relative Efficiency in Per Cent.

Bare			Two Coverings			One Covering		
	B.T.U.	Per Cent.		B.T.U.	Per Cent.		B.T.U.	Per Cent.
1. Plain	1.28	100	1a. Plain	1.88	68.1	1b. Plain	2.08	61.5
2. 1/16-in. dust	1.44	89	2a. 1/16 in. dust	1.82	70.5	2b. White	2.05	62.5
3. Gray	2.225	57.5				3b. Gray	2.155	62.5
						4. Black	2.12	60.5
						5. Glazed	1.80	71.0

NOTE: Covering is asbestos paper. The loss is 1.32 B. T. U. for seven coverings and 1.26 B. T. U. for eight coverings, showing a saving by covering only in the latter case. Colors are white and black calcimine and gray paint, the last of zinc, linseed oil, and lithpone composition. Glazed surface in No. 5 obtained by layer of printer's proofing paper. Sheet-iron of No. 28 gauge gave results as follows: 1.33 B. T. U. and 96% efficiency for galvanized-iron and 2.37 B. T. U. and 54% efficiency for black iron, very rusty.

TABLE 2—RISE IN TEMPERATURE OF BENZINE IN TANKS PAINTED VARIOUS COLORS (GLOSS FINISH)

WHEN SUBJECTED TO RAYS OF CARBON ARC FOR 15 MINUTES

	Temperature Deg. F. Initial	Final		
Aluminum	20.5	**26.6**	Tin Plate (no paint)	
White	22.5	**29.7**	Black	
Light Cream	23.0	**36.7**	Dark Chrome Green	
Light Pink	23.7	39.9	Dark Prussian Blue	
Light Blue	24.3	54.0	Red Iron Oxide	
Light Gray	26.3	19.8	Light Green	

TABLE 3—RISE IN TEMPERATURE OF WATER IN PAINTED TUBES IN 20 MINUTES

WHEN EXPOSED TO RAYS OF NITROGEN-FILLED LAMP

Gloss White	2.9	Gloss Green	6.9
Flat White	3.1	Flat Green	7.1
Gloss Yellow	5.5	Gloss Red	7.7
Flat Yellow	5.8	Gloss Black	7.9
Gloss Blue	6.1	Flat Red	8.2
Flat Blue	6.7	Flat Black	10.5

ing a matte surface. Table 3 is published in loose-leaf data sheet form by Lefax, along with other tables, such as those dealing with the reflecting values of colored paints and the effect on reflecting values of the vehicle of white paints and slight tints of white pigments ground in flat varnish. It is said therein that flat, semi-gloss, and high-gloss paints have substantially the same illuminating value when prepared of the same pigment mixture with oils or varnishes of the same degree of color. The author also states that according to Louis Bell (*Elec. World*, Jan., 1915) traces of carbon in a paint (gray) or dust on a painted surface immensely decrease the illuminating value.

THE EFFECT OF PAINTING RADIATORS

Table 4 shows the heat loss or radiating values in per cent. or B. T. U. for radiators painted various colors, and that aluminum, copper and metal pigments in the bronzes reduce the heat transmission, as metals have a poor radiating effect. The experiments showed that painting changes the radiation constant of the radiating surface with practically no effect upon the heat loss by convection. It is, therefore, a surface effect, and no matter what paint is used for priming, the results depend upon the last coat. The author states further that all finely-ground materials have about the same radiation constant. Therefore, all paints having finely-ground pigments give about the same effect.

TABLE 4—EFFECT OF PAINTING 2-COL. 38-IN. RADIATORS.

Temperature Steam 215° F., Room 70° F.

Surface	Per Cent.
Bare	240
Aluminum Bronze	200
Gold Bronze	205
White Enamel	242
Maroon Japan	240
White Zinc	242
No-Lusture Green	230

In connection with the question of proper color, it is significant that the Standard Oil Company and Public Service Commission of New Jersey are painting their tanks light tan and that railroad tank cars are painted black, though the color, no doubt is selected primarily for serviceability. In general, oil companies are using oil coolers, instead of relying on nature which is not always fast enough or sure enough to accomplish the purpose. As for the heat loss through ¼-in. sheet steel, use 1.3 B. T. U. per square foot per hour per degree of temperature difference between inside and outside of tank.

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Table 1—Bull. No. 117, Emissivity of Heat From Surfaces, The University of Illinois, Urbana.—Similar results obtained by T. S. Taylor at the Westinghouse Research Laboratory (See THE HEATING AND VENTILATING MAGAZINE, Jan. 1920, The Value of Sheet Asbestos on Hot Air Pipes).—This issue also shows how louvres in windows of photometric rooms were painted a matte black so as to absorb 80% of the light while providing for ventilation. See P. 45.

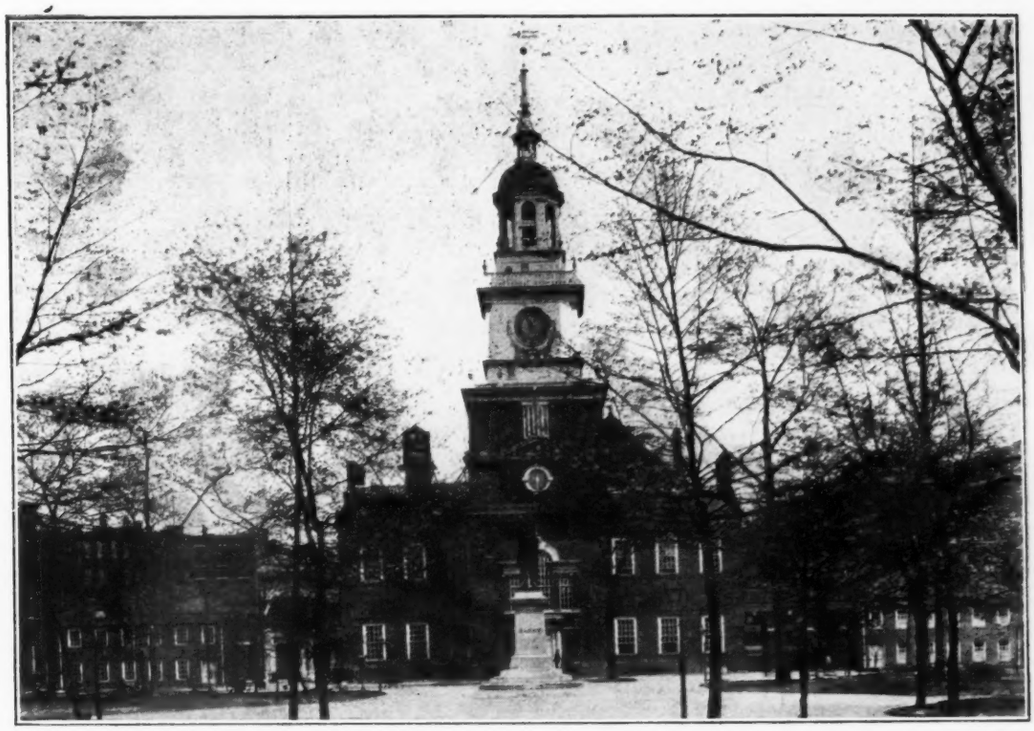
Table 2—THE HEATING AND VENTILATING MAGAZINE, March, 1922, The Heat Reflecting Properties of Colors, from a paper by H. A. Gardner at Philadelphia before the Penn. State Assn. of Master Painters and Decorators. —Similar notes by Mr. Gardner as follows: Amer. Gas Light Jour., New York, 1916,—Paint, Oil & Drug Review, Chicago, 1916,—Drugs, Oils & Paints, Phila., 1917, —Institute of Industrial Research, Bull. 50, and J. B. Lippincott Co., Phila., 1916, as reprinted from Jour. Franklin Institute.

Table 4—Jour. A. S. H. & V. E., Jan., March, 1920, by John R. Allen.—Notes on same in the Guide, A. S. H. & V. E.,—THE HEATING AND VENTILATING MAGAZINE, March, 1920,—Paint Mfgrs. Assn., Circ. 7, also various hand books, such as those by Harding and Willard, Allen and Walker, Hoffman, Carpenter, and Dibble.

Finds Aluminum Paint Makes Radiators Less Efficient

The aluminum or bronze paint generally applied to radiators greatly reduces their effectiveness and makes it necessary to have a larger surface for the same heating effect, according to experiments performed by Dr. W. W. Coblentz of the Bureau of Standards. Dr. Coblentz finds that the heat radiated from an aluminum painted radiator surface is less than a third of that emitted by a radiator of the same size painted with a non-metallic paint, enameled, or simply allowed to rust.

On the other hand he finds that aluminum paint is a very effective means of reducing the amount of heat transmitted through a thin material. Applied to the under side of a tent or awning it reduces by three-fourths the amount of heat from the sun which gets through the cloth, while if used on the cover of an automobile or ice wagon it cuts in half the heat let through and makes the temperature inside the vehicle more nearly that found in natural shade, thereby making it much more comfortable.



Independence Hall, Philadelphia.

Remodeling the Heating and Ventilating System in Independence Hall

Changes Found Necessary in this "Famous Group of Buildings," with Details of the Work of Installation

BY T. W. REYNOLDS

IF THE legislators of Colonial days could drop in at Independence Hall, at Philadelpia, one of these frosty mornings, how they would open their eyes with wonder at the warmth and comfort within, albeit no means are in evidence providing for such warmth. To be sure, the fireplaces originally provided in the building or, rather, group of buildings, when they were erected in 1729, are still intact, but their cheery flames have long since ceased to toast the toes of these worthy patriots.

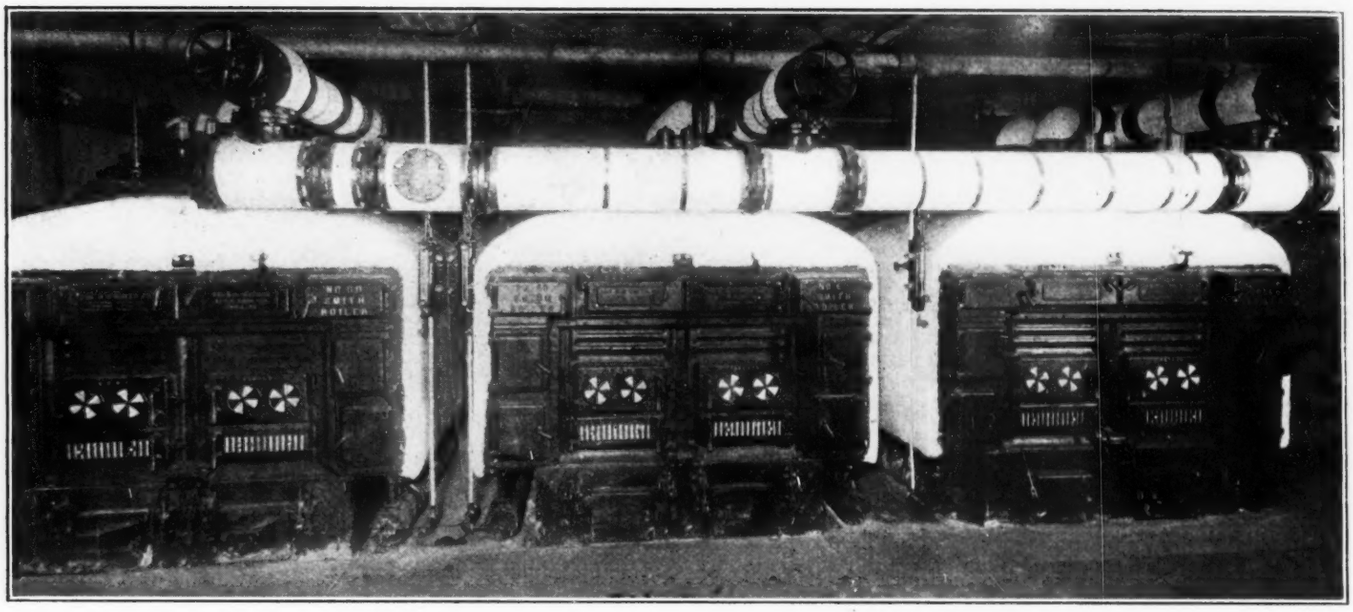
For many years now a modern, prosaic, but entirely useful steam heating system has taken the place of the inadequate fireplaces, but here again the march of progress has shown the need of further changes in the equipment. As originally installed, the steam heating system was in the form of indirect radiation supplied with steam from four separate low-pressure gravity plants. Two of these plants were in Congress Hall and two in Independence Hall. The old City Hall, which is also included in the group, was heated by a warm-air furnace.

In the remodeled system, which has now been completed, the heat is supplied from one source and is of the two-pipe vacuum type, with connections to new fanblast tempering heaters and old and new indirect reheating benches. From these benches flues, sheetmetal lined, are carried up in the walls, terminating, in most cases, in the old-fashioned stone fireplaces, thus preserving intact the original interior.

Among the problems involved in the remodeling of the heating system, which was entrusted to the engineering firm of Stewart A. Jellett Company, of Philadelphia, Pa., were the location and installation of a suitable central boiler plant, keeping in mind the necessity of avoiding any possible fire hazards; also the installation of modern equipment while preserving the original interior and exterior. It was also necessary to condition the air for the preservation of furniture and relics in the building. As much of the existing equipment was used as was found suitable.

Under these conditions, it became necessary to excavate for the boilers, and this was done, as shown in the photographs, in the square just outside of City Hall. The boiler room was placed below grade with a con-

Independence Hall was designed by Andrew Hamilton and was completed in 1734. At first it was occupied as a State House. In 1775 it became the assembly place of the Colonial Congress. Five years later, the State legislature occupied the buildings. Its fame, of course, rests principally on the act of the Colonial Congress when, on July 4, 1776, it adopted within those walls, the Declaration of Independence. The famous old Liberty Bell, which sounded the news, is enshrined in the main building. Independence Hall was also the scene of the adoption, in 1787, of the Constitution of the United States. In later years, United States, district and municipal courts have had their quarters in these wonderful old buildings.

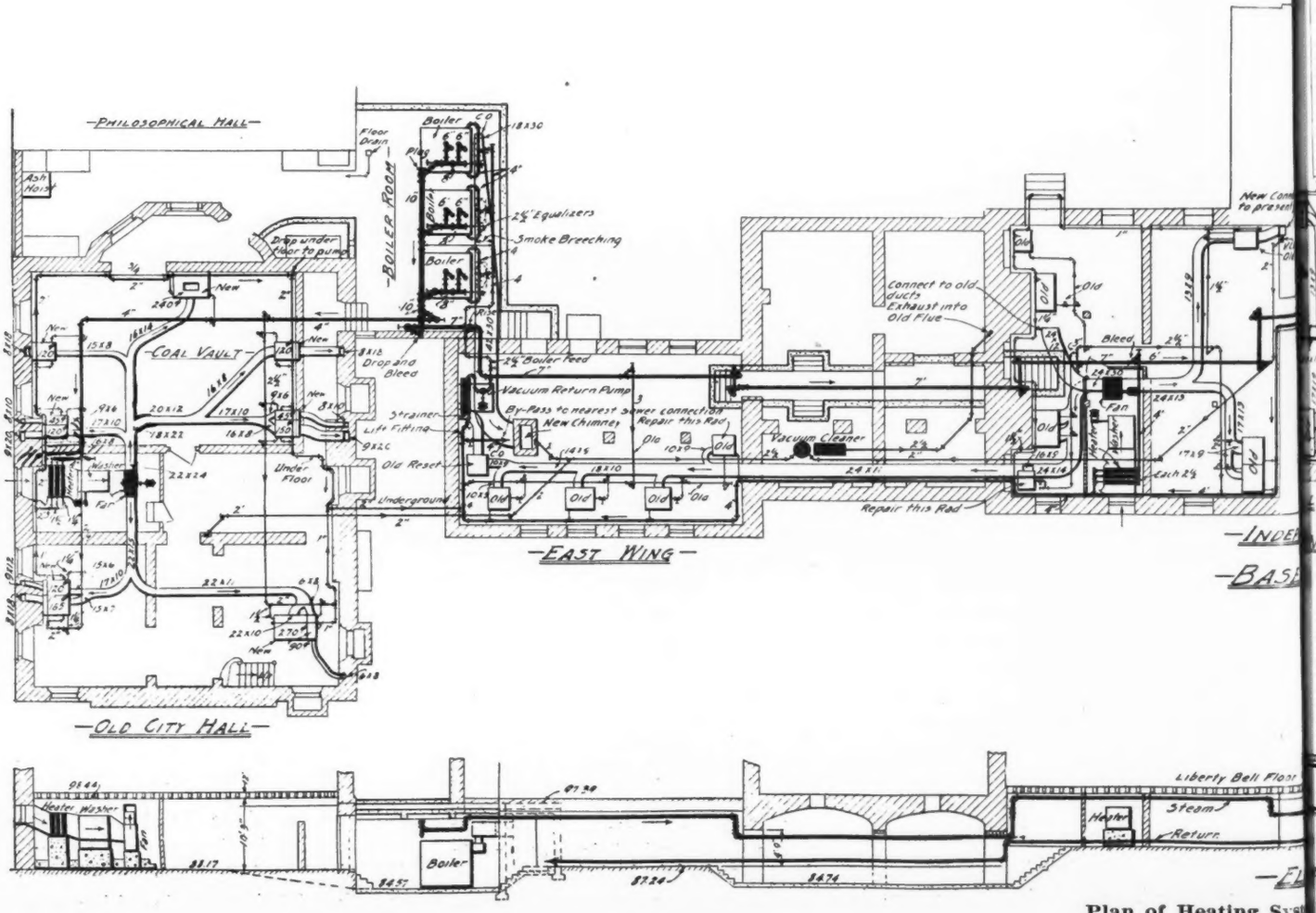


Boiler Installation, Independence Hall.

crete slab and the surface then restored at grade to the original. After much debating, a suitable chimney was secured in the east wing, instead of enlarging one of the present chimneys. Provision for ash removal was made by the installation of a telescopic overhead crane hoist and automatic sidewalk door.

METHOD OF PIPING STEAM SUPPLY AND RETURN CONDENSATE.

Boilers are of cast-iron, of the vertical slab type, three in number, each with 13 sections and 60 in. by 66 in. grate. Each boiler is provided with a 2½-in. equalizing pipe and two 6-in. outlets connecting to an 8-in. mani-



Plan of Heating Syst

fold, thence to the 10-in. header supplying the 4-in. and 2-in. mains.

With the boilers located near one end of the building group, it became necessary to run the larger steam main a considerable distance to the other end, 460 ft. in all. This necessitated a number of swing expansion joints, as well as drops and rises at various points, such pockets, together with all others in the steam lines, being dripped into the return line through thermostatic traps. Drip pockets were then left on the steam side of traps to allow cleaning.

Condensation flows back through a line, mainly 4-in. size, about 660 ft. long, and with but one drop and a rise near the *vacuum return pump where a lift fitting is used. Return lines passing doors were dropped so as to pass the condensation in the run under the floor while the air flows through a ¾-in. by-pass over the door. Underground lines were coated with black asphaltum, insulated, and encased in terra cotta pipe.

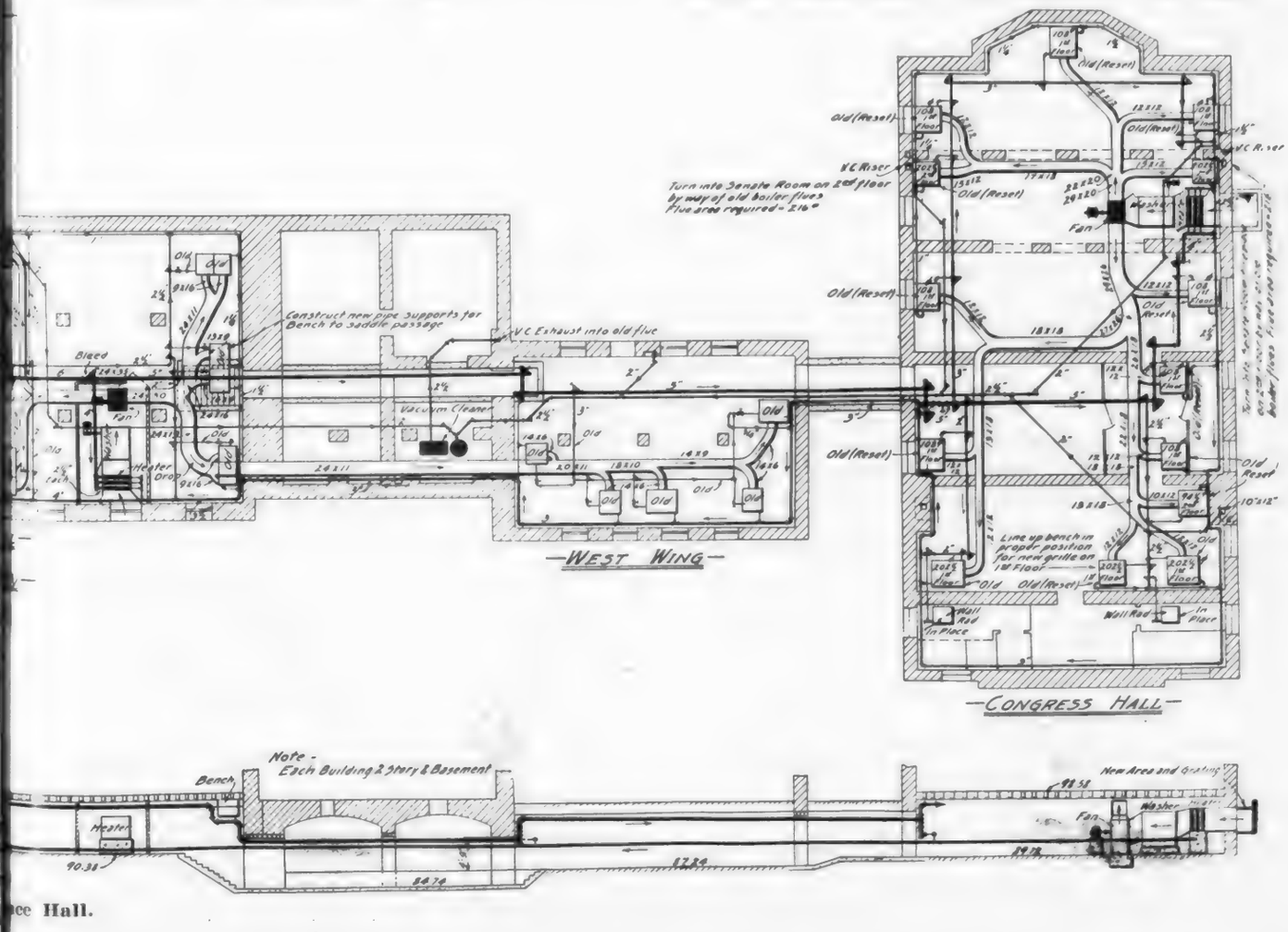
OLD MATERIALS USED WHERE POSSIBLE.

On the plans, it will be noted that certain of the indirect benches, as well as other old equipment remained in place, and that other parts were taken down, used in new locations, or repaired. Thus, sheet metal from old ducts and piping and covering, where removed and in good condition, were used in such portions of the work as was found possible. New canvas jackets and bands were placed on old reused covering.

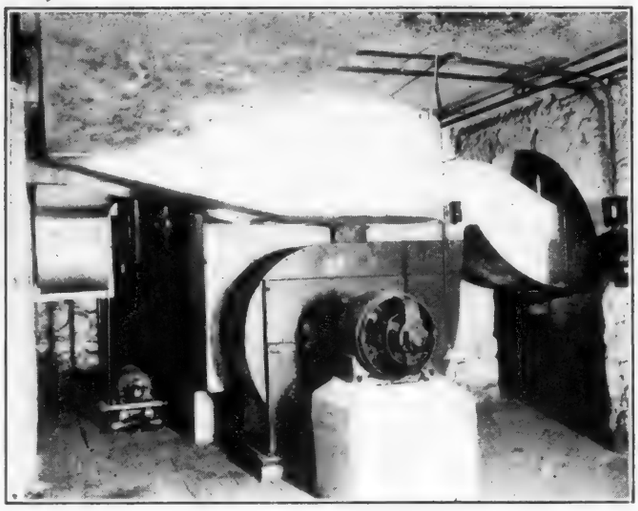
Boiler Room Passageway, Independence Hall.

Old City Hall was equipped with a complete new heating system, and Congress Hall provided with additional equipment on the second floor, certain of the present benches being moved and reset and others split into single tiers and located as shown. In other buildings, additional ducts and piping were installed and connected to ducts and piping previously existing. No sheet-metal linings were used in old flues, but these were carefully washed out and cleaned.

* Turbine-type fitted with receiver. Capacity 40,000 sq. ft. of equivalent direct radiating surface. Direct-connected to 3 H.P. motor.



ce Hall.



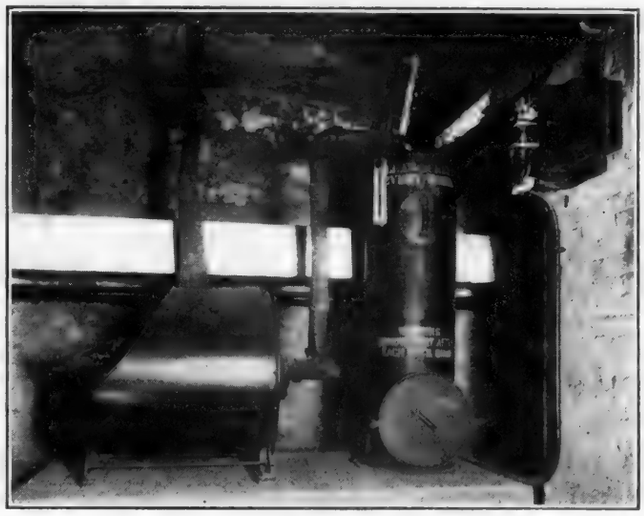
Typical Fan Unit, Independence Hall.

A system of thermostatic control with electric-driven compressor, formerly used in Independence Hall, was extended so as to control all indirect benches and fan-blast heaters throughout the buildings, room thermostats being installed to control their respective benches.

Each air supply system is also regulated by thermostats, one in the cold-air chamber controlling the first row of heaters and another in the discharge of the fan so as to operate thermostatic valves of the second and third rows of the heaters. In Independence Hall the return ends of indirect benches and the dampers in ducts were formerly equipped with themostatically-controlled valves and as these are not required in a vacuum system they were removed and used wherever found possible.

Air washers were provided for moistening and cleaning of the air, together with fans and tempering coils, so that ventilation and air conditioning can be regulated throughout the year. Four such systems are installed, two in Independence Hall, one in Congress Hall, and one in Old City Hall. The outfit in Congress Hall consists of a full-housed blower fan (8900 cu. ft. per minute) direct-connected to a 3-H.P. 220-volt D.C. motor running at 255 R. P. M., a 10,000 cu. ft. air washer with 3-H.P. motor direct-connected to a double-suction centrifugal pump, and three rows of heaters, each 12 sections of 40-in. Vento on 5 ⅜-in. centers, a total of 387 sq. ft. of radiating surface. The remaining outfits are somewhat similar, each consisting of a 7000 cu. ft. blower and washer, and a three-row 10-section Vento heater (322½ sq. ft.).

Fan Unit and Casing, Independence Hall.

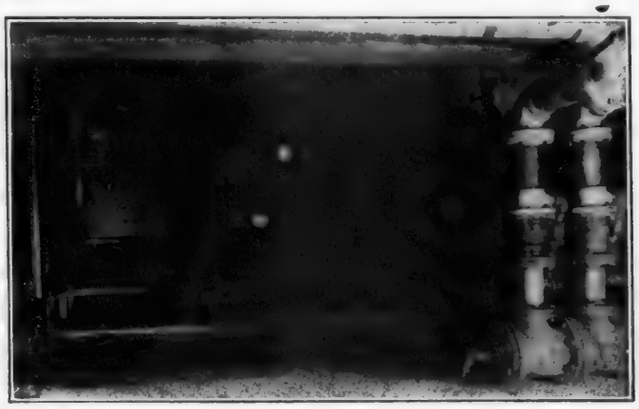


Vacuum Cleaning Outfit, Independence Hall.

Pipe Lines From Congress Hall to West Wing of Independence Hall.

To deaden the sound of fans and motors, a ½-in. layer of compressed cork was placed under all fans and motors and heavy canvas connections made between fans and sheet-metal ducts.

Outlets for vacuum cleaning were provided throughout the buildings and connected to two vacuum cleaners, one of which is shown in the photographs, the exhaust from these cleaners being run to old boiler flues. An elaborate sprinkler and fire protection system was also installed.



Pump Room, Independence Hall.

The Cooling of Air

A Plain Exposition of a Subject That Is Having a Wide Application in Engineering Work

BY J. ROGER PRESTON

(From a paper presented at the Summer meeting of the Institution of Heating and Ventilating Engineers, Folkestone, England, June 19.)

MODERN physiological research all tends to prove the necessity of keeping the wet-bulb temperature within narrow limits, say from 54° to 58° F., if we wish to insure comfortable and healthful conditions in our buildings. The object of this paper is to put into as few words as possible how conditions approaching this ideal may be obtained in a building when it is hot and humid outside. It is not intended to discuss the question as to whether a wet-bulb of 54° to 58° is the best under all conditions, but to take it as a basis for the purpose of this paper.

First of all, let us consider what the cooling of air means, in terms of British thermal units. I would like to point out here that it is not the intention to go deeply into fine scientific details and points about which authorities differ, but rather to put before you information which may prove helpful, especially to those not intimately acquainted with the subject, and to give a clear conception of the matter.

The heat exchange in B. T. U. in cooling or heating air over a given range of temperature, is not materially different, provided that the dew-point is not reached. Should, however, the initial humidity be such that the dew-point is reached in the cooling, another very important factor is introduced, a portion of the aqueous vapor being condensed and giving up its latent heat in the process.

The B. T. U. involved in the heat exchange may be ascertained by the following, which is accurate enough for all practical purposes and shows the various points involved:

$$\text{B.T.U.}_c = \underbrace{L_c\,(W_1 - W_2)}_{\text{SECTION A.}} + \underbrace{Sv\,(T_1 - T_2)\,W_1}_{\text{SECTION B.}} + \underbrace{S_a\,(T_1 - T_2)}_{\text{SECTION C.}}$$

Where T_1 = Initial temperature of dry-bulb.
T_2 = Final temperature of dry-bulb.
D = Temperature of dew-point.
W_1 = Weight of aqueous vapor per pound of air at final temperature.
W_2 = Weight of aqueous vapor per pound of air at initial temperature.
L_c = Average latent heat of vaporization or condensation at D and T_2.
Sv = Specific heat of vapor.
S_a = Specific heat of air.
B.T.U._c = B.T.U. required to cool 1 lb. of air from T_1 *to* T_2.

Basic figures to be taken in the following and other examples:

S_v = Specific heat of aqueous vapor, taking water as unity, 0.44.

S_a = Specific heat of air, taking water as unity, 0.2415.

It may be as well to mention here that 0.238 was at one time the accepted figure for the specific heat of air, and will be found in many text-books, but 0.2415, or sometimes 0.24, is now accepted as more nearly correct.

It will be seen that the B.T.U.c is the sum of the sections A, B and C. They are divided into sections so that the process can be readily grasped.

Section A—Dealing with the heat exchange due to the latent heat of vaporization or condensation when the vapor is changing its state into water.

Section B—The cooling of the vapor contained in the air; strictly, after the dew-point is reached there is slightly less vapor each degree, but the difference is so very small that it is neglected in this formula.

Section C—The cooling of the air from the initial to the final temperature.

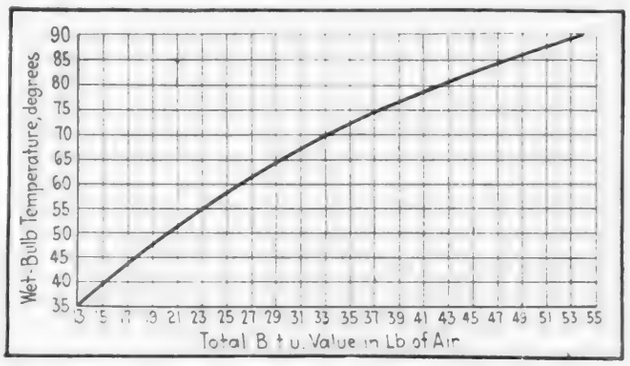


Fig. 1—Chart for Figuring Heat Exchange for any Given Alteration in Temperature and Humidity.

EXAMPLES

To cool 1 lb. of air from 60° to 40° F. (1) with a relative humidity of 43%, having a dew-point of 38° and a wet-bulb temperature of 49° and (2) with a relative humidity of 73%, a dew-point of 53° and wet-bulb temperature of 55°.

No. 1 would require an absorption of 4.9 B.T.U. per pound of air.

No. 2 would require an absorption of 7.9 B.T.U. per pound of air.

It will thus be seen that the mere fact of the higher humidity in the initial temperature causes an increase of 61% in the amount of heat to be absorbed due to the fact that the dew-point in No. 2 is considerably above the temperature to which we wished to cool the air.

Another way of ascertaining the amount of heat ex-

change for any given alteration in temperature and humidity is to remember that the total heat content of a mixture of air and vapor is the same at any given wet-bulb temperature, so that it is only necessary to obtain the wet-bulb temperature to directly estimate the number of B.T.U. to be absorbed or added for any set of conditions; the dry-bulb temperature may be entirely disregarded if the wet-bulb temperature is known.

The chart shown in Fig. 1 will enable this to be readily done.

Having ascertained the B.T.U. involved in the heat exchange of any problem we may have in hand, the next thing to consider is how to effect this heat exchange in the most efficient manner to bring about the desired result.

The method to be chosen will depend very largely on:

The initial temperature of the air.

The initial humidity of the air.

The final temperature of the air.

The final humidity of the air.

Fig. 2 is a chart showing the relative humidity and dew-point of the air at different dry-bulb temperatures, and assuming a constant wet-bulb temperature of 56°.

1. Standard type of air washer, with the spray water recirculated.
2. Air washer using water continuously, generally from artesian well or some other cheap and cool supply.
3. Air washer with the spray water artificially cooled by refrigeration or by blowing air over coils of pipe kept cool either by brine or by direct expansion from a refrigerating machine.

Take Method 1 when the incoming air is brought into contact with the spray water, this being finely atomized so as to insure as perfect mixing of the air and water as possible. The cooling usually effected by this method is 60% of the wet-bulb depression (though some makers will guarantee 85%).

Table 1. will show what this means to the nearest degree.

TABLE I.
Initial Condition of Air.

Dry-Bulb, deg. F.	Wet-Bulb, deg. F.	Relative Humidity, Per Cent.	Dew-Point, deg. F.
90	71	39	60
80	67	50	60
70	64	72	61

TABLE II.

After Leaving Washer

Dry-Bulb, deg. F.	Wet-Bulb, deg. F.	Relative Humidity, Per Cent. (60% Basis)	Dew-Point, deg. F.
79	71	68	67
72	67	77	64
66	64	90	63
		(85% Basis)	
74	71	86	70
69	67	90	66
65	64	95	63

It will readily be seen from the above that, while there is a reduction in the dry-bulb temperature, depending on the initial relative humidity, there is no reduction in the wet-bulb—that the relative humidity is higher and that the actual amount of aqueous vapor in air is higher by the amount absorbed from the washing water, so that as regards our physiological ideal this method is not of much help, however useful it may be in other respects.

We will now consider Method 2, limiting our spray water to 52°, the usual temperature of artesian well water. With a well-designed washer it is possible to reduce the temperature of the air to 57°. It would, of course, be saturated at this point, having a dew-point of its own temperature, giving the results as follows, with the initial conditions as in Table I.

TABLE III.

Air Leaving Washer at All Temperatures in Table I

Dry-Bulb, deg. F.	Wet-Bulb deg. F.	Relative Humidity, Per Cent.	Dew-Point, deg. F.
57	57	100	57

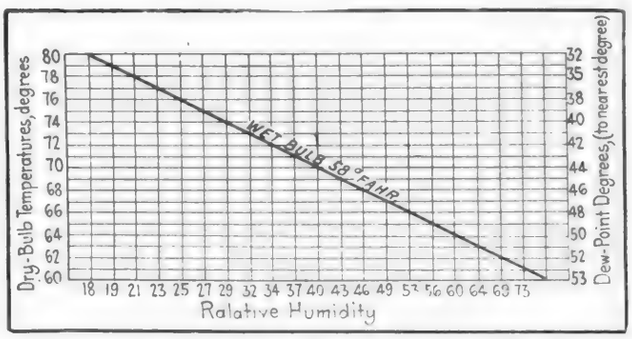


Fig. 2—Relative Humidity and Dew Point of Air at Different Dry-Bulb Temperatures.

Now, assuming that it is 90° outside, with a relative humidity of 39%, wet-bulb 71°, as per the first line of Table I, and we decide to have the air in the building at about 70°, obtaining this by mixing the saturated air leaving the washer with the outside air in proper proportion. We shall then get approximately:

Dry-Bulb, deg. F.	Wet-Bulb, deg. F.	Relative Humidity, Per Cent.	Dew-Point, deg. F.
69	62	69	58

or, should we decide to heat up the air so as to get a higher dry-bulb temperature, we should get:

Dry-Bulb, deg. F.	Wet-Bulb, deg. F.	Relative Humidity, Per Cent.	Dew-Point, deg. F.
80	65	45	57

The amount of cooling water required to bring about the above result can be found by the following formula:

$$\frac{\text{B.T.U.}}{(S_2 - S_1)\ 10} = \text{gallons of water.}$$

Where B.T.U. = total B.T.U. absorbed by the air and vapor in being cooled from the initial temperature to 57° (in this case 10 B.T.U. per pound of air).

S_1 = temperature of water entering washer.

S_2 = temperature of water leaving washer.

It will be seen from the above that a good supply of water from an artesian well or other source at 52° and at such a price that it need not be recirculated, allows

of quite a beneficial amount of cooling being carried out, in conjunction with a material reduction of humidity, with its consequent lowering of the wet-bulb, for any given dry-bulb temperature; in fact, many people would say it provides the whole range necessary for comfort and health with the initial temperatures and humidities obtained in this country.

It will be observed, however, from the foregoing that we are limited with Methods 1 and 2, and have very little flexibility both as regards final temperatures and humidity.

FLEXIBILITY OBTAINED WITH REFRIGERATION.

Method 3, employing refrigeration in some form or other, gives us great flexibility, should we require it, and coupled with a heater we can get any temperatures or humidities we are likely to require.

While, no doubt, there is a difference in the efficiency of various makes of machines, due to modifications in design and workmanship, there is very little between the efficiency of the two mostly-used refrigerants, viz, ammonia and carbonic dioxide, when everything is taken into consideration; the choice, therefore, depending on local circumstances and surroundings. Ammonia is mostly used, but for comparatively small machines, especially when condensing water can be obtained at an initial temperature not exceeding 70°, carbon dioxide will generally be found suitable and is gaining considerably in favor.

It is not proposed to deal with the different types of refrigerating machines and their details, as this is not a paper on refrigeration, but there are two points, however, that depend on local conditions and requirements, to which particular attention should be paid, viz, the temperature of condensing water and evaporating temperature at which it is proposed to work the plant. An important point, especially in CO_2 machines, is the temperature of the cooling water owing to the comparatively low critical temperature of this refrigerant, and when the initial temperature of the cooling water is above, say 68°, it is advisable to use such an amount of water as will not allow the mean temperature between the inlet and outlet of the condenser to exceed 75°; with ammonia the mean temperature may be 90° to 95°.

Table IV. shows the relative B.H.P. of a machine with different temperatures of condensing water.

TABLE IV.

Mean Temperature of Condensing Water, deg. F.	Relative Efficiency when evaporating at 32° F.	40° F.
75	61	53
65	53	45
55	46	40
45	40	36

It will be noted that for a given unit of work, 36 B.H.P. is needed with a mean temperature of cooling water at 45° and with an evaporating temperature of 40°; but when the cooling water is 75° and the evaporating temperature 32°, the B.H.P. is 61, an increase of 70%. This also shows how important it is to ascertain all the particulars when considering the rating of a machine.

In comparing the cost of a plant and B.H.P. required to drive it for any given B.T.U. output, it is important to the ventilating engineer to know on what temperature of the condensing water and evaporating temperature the capacity is based, in the same way as he would want to know the speed and water-gauge of a fan.

The capacity of a refrigerating machine is usually rated by the ton of refrigerating refrigeration equal to 200 B.T.U. per minute, or 12,000 B.T.U. per hour, or 288,000 B.T.U. in 24 hours, eliminated or absorbed in or by the evaporator. Twenty-four hours is the usual basis.

Again taking Table I, and requiring to deal with same so as to conform to a common wet-bulb temperature of 56°, dry-bulb of 75°, 70°, 66°, it is obvious we must cool the air sufficiently to condense the surplus moisture (only leaving sufficient to give 56° wet-bulb at the desired dry-bulb temperature), and then heat the air to the required dry-bulb temperature. Table V. shows the initial, intermediate, and final state.

TABLE V.

Dry-Bulb, deg. F.	Wet-Bulb deg. F.	Rel. Humidity Per Cent.	Dew Point deg. F.	Heat Content B.T.U.	Heat Exchange B.T.U.	Net Heat Transfer B.T.U.
Initial Stage.						
90	71	39	60	34.33		
80	67	50	60	31.15		
70	63	72	61	28.93		
Intermediate Stage.						
After being dealt with by Cooling Apparatus.						
39	39	100	39	14.76	19.57	
44	44	100	44	17.10	14.05	
48	48	100	48	19.12	9.81	
Final and Desired Stage.						
After Heating.						
75	56	27	39	23.64	8.88	10.69
70	56	40	44	23.64	6.54	7.51
66	56	53	48	23.64	4.52	5.29

To carry out the above it would be necessary to evaporate at, say 29° for the lowest temperature and 38° for the highest temperature, which represents a thermal head of 10°.

DIFFERENT METHODS OF OPERATING REFRIGERATING APPARATUS FOR COOLING AIR.

With reference to the day in which the cooling of air is brought about, the following show the different ways used in practice:

1. Allowing the spray water to trickle over the direct-expansion pipes and so cool it to the required temperature, say a few degrees below the desired dew-point temperature.

   Blowing air over direct-expansion coils.

   By employing expansion coils direct, the greatest thermal head is obtainable, and, consequently, the highest evaporating temperature and greater economy.

2. Arranging for the direct-expansion pipes to cool brine and in turn circulating the brine through coils immersed in the spray water or allowing the water to trickle over the coils. This has the disadvantage of losing thermal head, but has the advantages of being easily regulated, and of allowing for storage in case of breakdown.

3. Using water instead of brine. The remarks regarding the latter apply, except that it would only be suitable where the dew-point required was over, say 42°, otherwise the thermal head would be so small as to necessitate a very large cooling surface. One thing that can be done with water is to freeze it, and by arranging containers of suitable size instead of coils, make use of the latent heat of the ice in case of breakdown.
4. By mixing ice with the spray water. This would, of course, only be used in the absence of a refrigerating plant. Each pound of ice, in melting, would absorb about 142 B.T.U. from the spray water, thereby reducing its temperature. This method is very useful in some cases, but is expensive.

It may be noted that the condensing water for a refrigerating machine can be used (if it was initially suitable) after passing through the condenser for industrial or domestic purposes, as it will not have been altered in any way except having been heated, say 10°; also it does not matter how impure the water may be for use in the condenser, except in respect to any action it may have on metals.

HOW TEMPERATURE AND HUMIDITY MAY BE CONTROLLED BY DIFFERENT METHODS.

The following shows briefly the extent to which we can control the temperature and humidity by the various methods:

That a washer using recirculated water cannot materially change the heat content of the air, a certain degree of cooling can be obtained, but at the same time there will be a rise in the relative humidity, the wet-bulb temperature remaining the same.

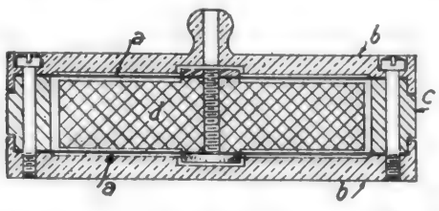
A washer using water from an artesian well or other source having an initial temperature of 52°, can cool the air to say, 57°, with a consequent reduction of vapor in the air, should its initial dew-point have been above 57°, which is most likely in hot weather.

That with refrigeration applied either in the form of blowing the air over the cool coils, or of cooling the spray water, we can reduce the absolute humidity to any reasonable figure, depending on the evaporating temperature, and combined with a heater, we can get any dry-bulb, wet-bulb temperature, or relative humidity we desire, within the range required in ventilation.

Locating Leaks in Underground Pipe Lines With the Geophone

In view of the discovery that the geophone, which was originally designed as a listening instrument for sapping and mining operations, can be used with equal success in locating leaks in underground pipe lines, the usefulness of this device to the heating industry, especially the central heating branch, is beginning to attract widespread attention.

As described by Alan Leighton in Technical Bulletin 277, issued by the Bureau of Mines, the geophone consists of a cast-iron ring about 3½ in. in diameter, as

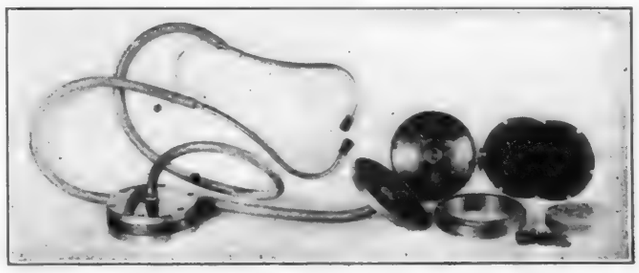


Cross Section of Geophone: a-Metal or mica disk, b-Cap plate, c-Iron ring, d-Lead weight.

shown in Fig. 1, in the center of which is suspended a lead weight fastened by a single bolt through two metal discs or diaphragms. One of the discs covers the top and the other the bottom of the iron ring. There are two brass cap pieces, the top one having an opening in its center to which is fastened a rubber tube leading to a stethoscopic earpiece. The cap pieces are fastened with bolts to the iron ring, are slightly recessed, and serve to hold the diaphragms in place. The extreme sensitiveness of the instrument is obtained by having the right proportions between the size of the lead weight, the size and shape of the case, and the thickness and quality of the diaphragm.

PRINCIPLE OF OPERATION

The geophone is essentially a small seismograph, as it embodies the same principles as the ponderous apparatus that records earthquake tremors. It really consits of a lead weight suspended between two elastic diaphragms cutting across a small air-tight box. If the instrument is placed on the ground and anyone is pounding or digging in the vicinity, energy is transmitted as wave motion to the earth, and the earth waves shake the geophone case. The lead weight, on account of its mass, and because it is suspended between the disks, remains comparatively motionless. Thus a relative motion is produced between the instrument case and the lead weight, with the result that the air in the instrument case is compressed and rarefied. As the rubber tube leading to the stethoscopic earpiece is connected with the air space in the geophone, this rarefication and compression of the air is carried to the ear drum. Usually two instruments are used, one for each ear. The geophone, therefore, transforms the earth wave into an air wave, which is heard by the ear as sound, and at the same time magnifies the wave so that the sound is louder than if the ears were placed in direct contact with the earth.



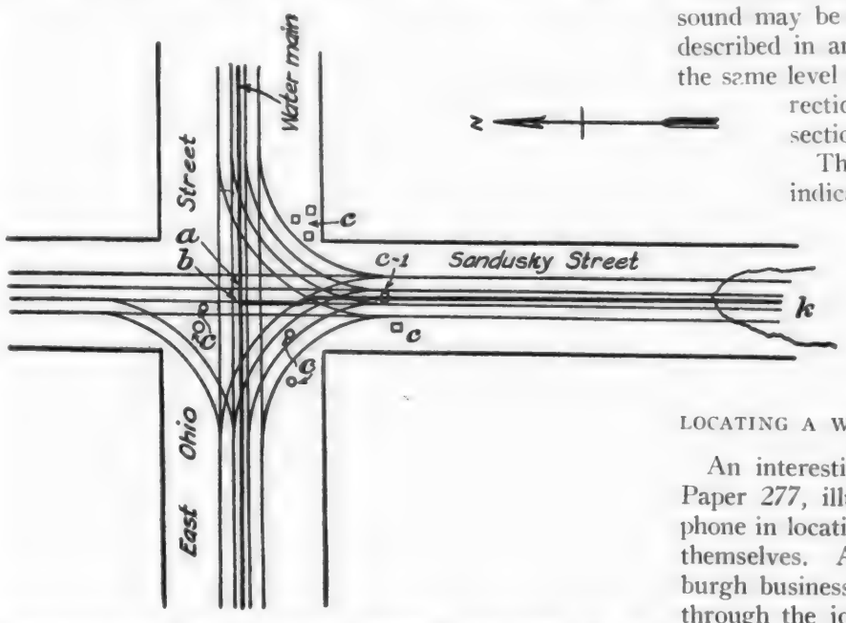
Geophone Complete with Stethoscope.

PLACING THE INSTRUMENT

In order to hear sounds through the earth the instrument must rest on natural ground. The soil should be carefully cleared and smoothed, and the instruments should be pressed firmly into place in order that the contact between them and the earth may be intimate.

FINDING THE DIRECTION

It is an established physiological fact that men instinctively estimate the direction from which a sound is coming through the air. When the sound is coming from the right, one hears it entirely with the right ear, and similarly on the left; but as the head is turned there is a point, which the ear is able to judge exactly, where the sound is heard equally in both ears and is therefore judged to be coming from in front or from the rear. This matter is largely one of equality of phase, or the time of arrival at each ear of corresponding sound-wave phases, and not a question of intensity. Thus a man with considerable difference in the sensitivity of his ears may still determine direction.



Intersection of Two Pittsburgh Streets, Showing Leak in Water Main Located by Geophones.

When one is already facing in the general direction from which a sound is coming, the most accurate method of locating direction is to turn the head to the right, for instance, until the sound becomes perceptible only to the left ear, then to the left until the same sound becomes perceptible only to the right ear. By turning the head alternately to right and left, the sound is made to pass successively from right to left and from left to right. By decreasing progressively the range of these oscilliations of the head, one will stop in a position directly in line of the sound. As the author points out, the sensation of the passage of sound from one ear to the other is very important.

Similarly, by the use of two geophones, one instrument to each ear, it is possible to determine the direction from which a sound is coming through the earth. Two geophones are placed on the ground with an interval of 2 to 3 ft. between them, and if they are connected to suitable earpieces terminating in each ear, with pieces of rubber tubing of equal length, the arrangement is equivalent to placing both ears on the ground at the same time.

As soon as a sound is heard, the observer notes whether the sound seems to come from the right or from the left. He then shifts the geophone with his hands and succeeds by a series of tentative changes in their relative positions in finding a place for them where the sound seems to come from the front or rear and not from the right or left. A perpendicular erected halfway between the instruments will therefore give the direction of the source of sound, or, more accurately, the projection of this line of direction on the horizontal plane will pass through the source of sound.

Another line of direction of the propagation of the sound may be obtained by repeating the operation just described in another place—whether or not situated on the same level as the first point. These two lines of direction are projected on a plane, their intersection giving at once the source of sound.

This procedure, as is apparent, gives no indication of the elevation of the source of sound with relation to the observer. If it is desired to discover the vertical level at this point, it is only necessary to make an additional test analogous to the two preceding tests, this time on a vertical surface.

LOCATING A WATER LEAK IN A PITTSBURGH PIPE LINE

An interesting experiment is described in Technical Paper 277, illustrating the successful use of the geophone in locating leaks in pipe lines, as well as the pipes themselves. At one of the busy corners of the Pittsburgh business district, water was found to be seeping through the joints of the paving blocks at the point k, Fig. 3. This area was approximately 150 ft. from the intersection of the two streets. When the geophones were placed upon the paving at this point the sound of running water could be heard, the water seeming to come from the north. Sandusky Street at this point has a slight grade sloping to the south.

All the information it had was that the water was seeping out through the paving at k and that all of the gate boxes on the south side of East Ohio Street were full of water. Sounds of running water were first heard at k, and were followed back to gate box c_1, where the sounds were very loud. It was thought at first that the leak was located at c_1. Upon moving toward the center of the intersection of the street, however, the sound of running water was supplemented by a hissing sound. This sound could be heard anywhere within a radius of 40 ft., and determinations of direction all showed that it came from the supposed location of a tee where the 10-in. main running down Sandusky Street joined the 15-in. main on East Ohio Street. The water company's map showed that the tee was located at the exact center of the intersection of the streets. The geophones showed so conclusively that the leak was in the tee that accurate observations were not made to locate the sounds with respect to the center line of the street. Digging showed that the tee was 3 ft. west of the point shown in the company's map. The water was issuing from one of the joints of this tee.

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JUDGING from the hints and suggestions continually cropping out in various ways and from a variety of sources, one might easily be led to the conclusion that a studied propaganda was being conducted by the plumbing trade to make that industry the heir of what is now known as the heating and ventilating industry. We had occasion to comment last month on the proposal emanating from a college professor to have the master plumber assume the dignity of a sanitary engineer and, at the same time, embrace, under that heading, heating and ventilation. Previous to that the board of directors of the Heating and Piping Contractors' National Association took the trouble to point out in their annual report the tendency in some quarters to use the terms plumbing contractor and heating contractor indiscriminately and even to call the heating contractor a "heating dealer."

Some years ago there was a separate organization of journeymen steam fitters and steam fitters' helpers which was later absorbed by the journeymen plumbers' organization. On the other hand, as recently as last June the National Association of Master Plumbers went on record as favoring the establishment of a college scholarship in sanitary engineering. Is there a bacillus connected with either one of these events that is entering the vitals of the plumbing industry? If so, it is at least a striking compliment to the heating industry on the advanced position it has achieved.

The fact is that the plumbing industry of to-day is far ahead of the public's appreciation of what modern plumbing really means and, to that extent, is laboring under a handicap which extends back to the day of the plumbers' jokes and alleged high charges. It would seem the part of wisdom for the industry to continue to address itself to the eradication of the public's misconceptions regarding its activities, rather than to pursue a chimera which is advancing at an even faster pace.

A CONTEMPORARY asks, "As a heating industry, are we in a rut?" and agrees, after a discussion of the subject, that we are. As evidence in support of this conclusion our contemporary points to the fact that we achieve only from 30% to 75% perfect combustion in our heating apparatus, while from 40% to 60% of the heat developed passes out through the chimney. The industry is marking time, concludes our contemporary, and there is no concerted co-operative effort among manufacturers of heating apparatus to overcome or solve the problem of the tremendous waste of fuel and heat. "To reign supreme," adds the writer, "we, as a heating industry, must solve it—otherwise we are doomed to be displaced by those whose efforts are successful in producing something better."

Well, for our part, we cannot conceive of an industry that has made greater progress along the very lines mentioned than the heating and ventilating industry. If boilers are still as wasteful of fuel as in the old days, the fact remains that their adaptability to burn the cheaper grades of coal is a development in the right direction and one which has gone far towards solving the problem of final cost.

Again, how can the industry be marking time when it is able to announce, from two distinct sources, the perfection of a copper heater which, if successful may easily be ranked as one of the epochal events in the industry.

As far as our observation goes, the man who marks time to-day in the heating industry is likely to find himself far back in the ruck in short order.

IT is customary at this time of the year to hear of new inventions in the way of apparatus and appliances which are destined to "revolutionize the industry." In presenting, however, in this issue, an account of the latest achievements in the development of copper indirect air heaters, we feel that we are, at least, arriving at one more landmark in the development of the art. Not that copper air heaters are new, by any means. They have been in use for years in Europe and, before the World War, were being seriously considered in America by some of the larger manufacturers of heating apparatus. But the advanced design and construction embodied in the present products, as well as the auspices under which they are presented to the trade, stamp them as something important enough to arrest the attention of the heating profession. It looks as if one more aid of a highly useful type has been placed at the service of the heating engineer.

COMMENCING with the December issue, we will resume publication of the weather records of five representative American cities—New York, Boston, Pittsburgh, Chicago and St. Louis. These records have been a feature of this journal now for the past seventeen years and constitute a remarkable record of the weather variations during that period, covering the items of temperature, humidity and wind.

THE ADVENT OF THE COPPER AIR HEATER

Aerofin, the New Non-Corrosive Air Heater

What is described as a new and proved surface for the heating or cooling of air, marking the final development of investigations and experimentation extending over a period of eight years, has been brought out by the Aerofin Corporation, 750 Frelinghuysen Avenue, Newark, N. J., under the trade name of Aerofin. Aerofin itself has been developed since August 1, 1922. The secretary and chief engineer of the company, in charge of sales, is Lawrence C. Soule, who has been prominently identified with the blower system of heating and ventilation for the past eighteen years.

The characteristic feature of Aerofin, which is designed for use in indirect heating and cooling work, is its construction of straight seamless copper or brass tubing about which is wound a thin, narrow, helical extended surface, also of copper or brass.

In the development of Aerofin, seven factors were set up as pre-requisites: 1, light weight; 2, non-corrosive construction; 3, adequate strength; 4, compactness; 5, high transmission capacity; 6, ease and economy of installation; and 7, unit design, each unit to be encased and complete in itself.

Much importance is attached by the manufacturer to the way in which the helical extended surface is applied to the tubes. A special machine is used for this process which automatically corrugates the inner edge of the metal ribbon and winds the ribbon uniformly about the tube so that the pitch of the helix is uniform and the extended surface at right angles to the tube. During the winding process the machine treats the surfaces with acid and applies the molten solder which flows over the tube and extended surface so that both are entirely covered, forming a permanent metallic union. The finished tubes are then mechanically pressed into thin, flexible tube plates of copper or other non-corrosive metal, all the tubes being pressed into top and bottom plates in one operation. The tube plate, when punched, is also cupped or dished, around each opening and formed so that there is a deep collar about each tube when pressed into the plate. This construction provides a great contact area between the tube and the plate, and renders the plate flexible at the point of juncture with the tube, thus compensating for any movement of the tube due to expansion or contraction. As is well known, expansion and contraction of indirect heaters, which they undergo in operation, especially if under automatic control, is one of the chief factors in connection with their durability.

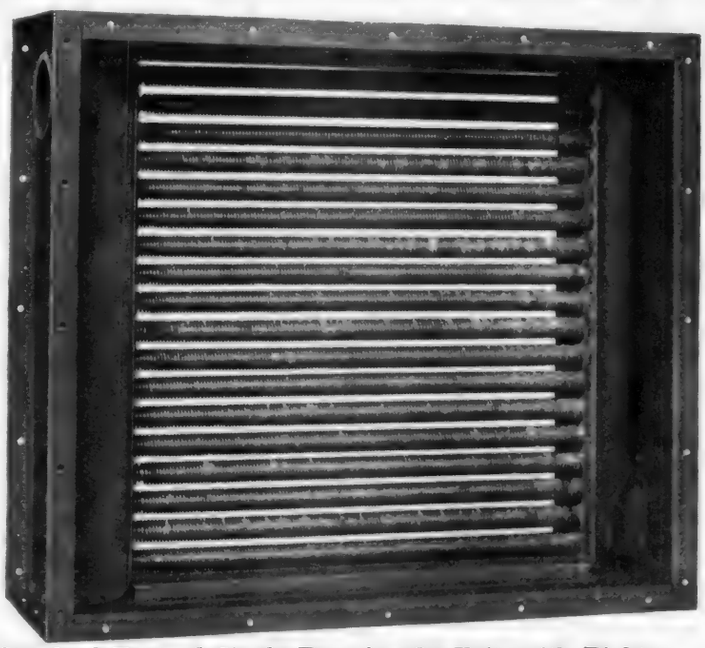
After the tubes are pressed in, the plates are dipped in solder, to effect a complete metallic union, and are then roll-seamed and soldered to pressed brass headers. There is flange-fitted to one end (or both ends) of the header, a brass hub with pipe tapping for steam or water supply and return. A small tapped brass hub is flange-fitted to each of the return headers for the attachment of the air vent.

The pipe tapping for each supply is 3 in., and for the return, 2 in. or 3 in., depending upon the size of the unit. As the supply and return tappings are at the ends of the pressed headers and open through the casings opposite the ends of the tubes, the units cannot be conveniently placed end to end, but are assembled side by side, as here shown. The standard method of installation is with the tubes horizontal, the tappings opening horizontally at either side. This permits the assembling of a battery comprising as many units in height as may be desired.

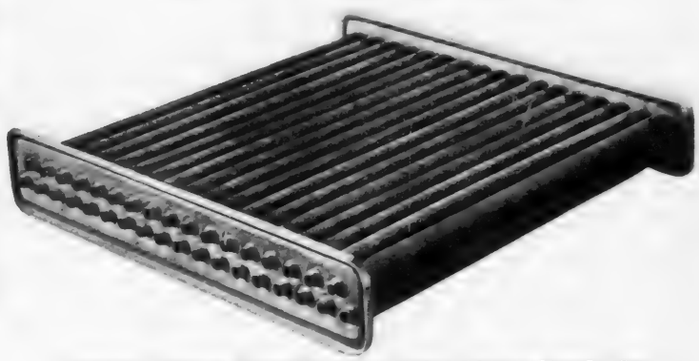
Reckoning both sides of the fins as transmitting surface, this extended surface of Aerofin comprises 80% of the effective transmitting surface of the unit, while the prime or tube surface constitutes but 20% of the total.

Two Standard Units, 3-Row Above, Single Row Below, Bolted Together to Show the Simplicity of Assembling the Units.

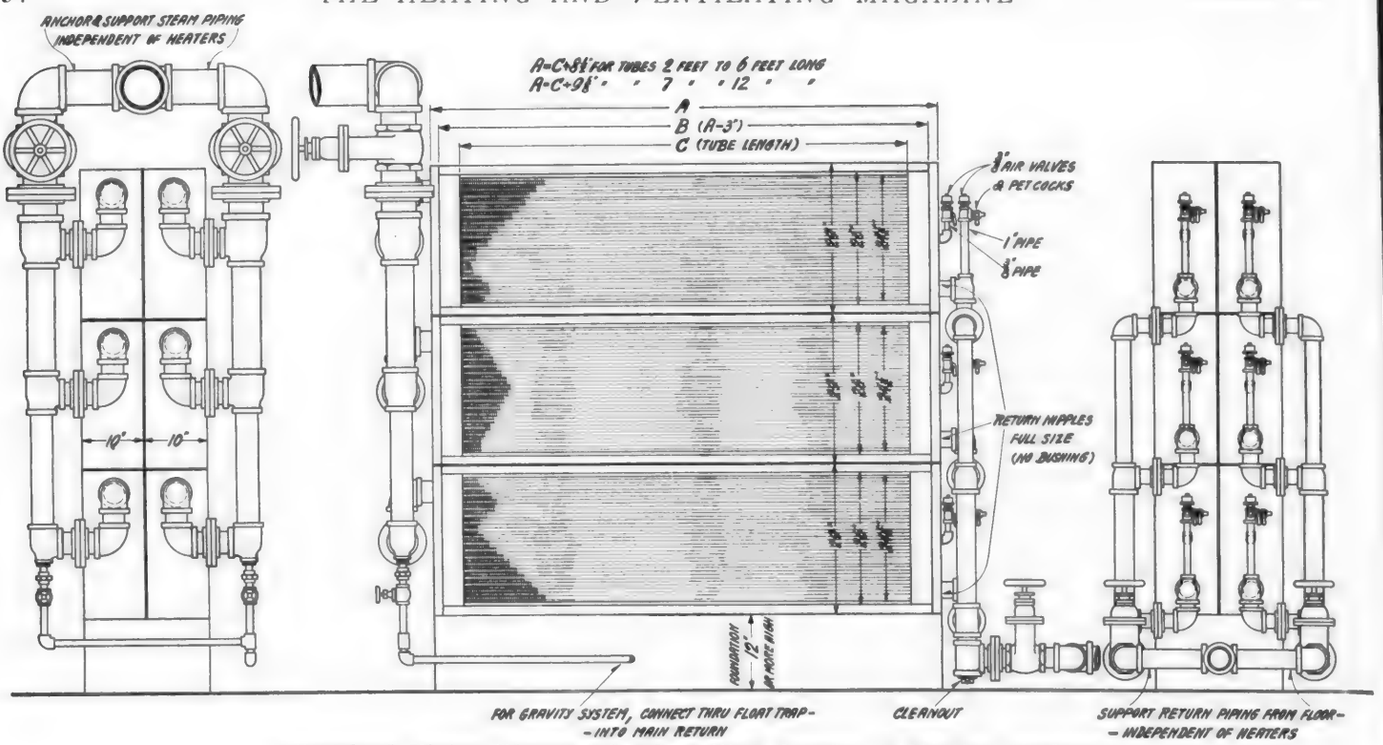
Aerofin units, including casing, weigh only 10% or 15% of the weight of the usual types of indirect heaters. This lightness, it is pointed out, obviates the need of heavy foundations and the point is also made that in installations on upper floors



Standard Encased Single Row Aerofin Unit, with Right Supporting Angle Removed to Show Pressed Header and Flange-fitted Brass Tapping Hub.



Aerofin Tubes Assembled in Tube Plates Ready for Attachment of Headers.

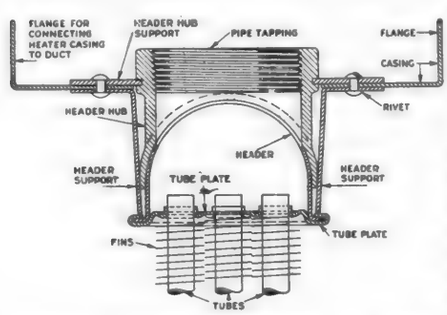

ANCHOR & SUPPORT STEAM PIPING INDEPENDENT OF HEATERS
A=C+8" FOR TUBES 2 FEET TO 6 FEET LONG
A=C+9" " " 7 " " 12 " "
A
B (A-3")
C (TUBE LENGTH)
3/8" AIR VALVES & PET COCKS
1" PIPE
3/8" PIPE
RETURN NIPPLES FULL SIZE (NO BUSHING)
10"
10"
FOUNDATION 12" OR MORE HIGH
FOR GRAVITY SYSTEM, CONNECT THRU FLOAT TRAP - INTO MAIN RETURN
CLEANOUT
SUPPORT RETURN PIPING FROM FLOOR - INDEPENDENT OF HEATERS

Standard Piping Diagram for Installing Aerofin as Heating Surface.

or roofs of buildings, the use of Aerofin avoids the necessity of strengthening the ordinary building construction. The importance of its non-corrosive qualities is emphasized, especially in such cases where iron rust, blown from the ducts, is extremely disagreeable and ruinous to certain manufacturing processs.

To insure adequate strength, a galvanized sheet-steel casing, riveted and strengthened by right angle flanges, is an integral part of every Aerofin unit. The core, including tubes and headers, is keyed rigidly to the casing, so that all the stresses of weight, pressure, expansion or contraction which may be externally applied to the unit are borne entirely by the casing. Standard Aerofin is built for 50 lbs. gauge steam or liquid pressure, and any vacuum.

The compactness of this new unit is remarkable as it occupies but one-third of the space ordinarily devoted to indirect heating stacks of the same capacity. This is due largely to the high-transmission capacity of copper and brass. The actual capacities of Aerofin in units of various sizes and at various velocities and pressures, have been worked out by the manufacturers through a long series of tests and are published by them in full.



Detail Showing Formation of Tube Plate, Aerofin Heater.

As can be easily appreciated, the lightness of these units serves to reduce greatly the cost of erection, piping connections, foundations and platforms. In the matter of price of Aerofin, as compared with cast-iron or pipe-coil surfaces, it is slightly greater for certain sizes, but this factor, it is stated, is much more than offset by the reduced cost of transportation and installation. The lasting qualities of Aerofin are also depended upon to further offset the initial cost.

At present Aerofin is manufactured in the 20-in. width only, so that all headers are alike. The present standard heater is 29 in. wide, overall, across the tubes and will accommodate a single row of 18 tubes; one row of 18 tubes staggered with one row of 17 tubes; or three staggered rows, the first of 18 tubes, the second of 17 tubes, and the third of 18 tubes. All units are 10 in. in depth in the direction of air flow and one row of tubes is about equal to one section or stack deep of cast-iron indirect surface.

The units are made up with tubes of any specified length between 2 ft. and 6 ft. in increments of 6 in.; and between 6 ft. and 12 ft., in increments of 1 ft. In this way Aerofin may be had in fifteen different tube lengths so that the one standard header length now available, it is pointed out, will still permit the units to be adapted to almost any requirement.

New Type of Low Pressure Copper-Tube Heaters

A new product has appeared in the heating field which has such unique characteristics as to be in many ways revolutionary in its possibilities. It is known as the Cartridge copper heater. It is manufactured by the United States Cartridge Company, of Lowell, Mass.

The heater itself is composed of a multiplicity of extruded seamless copper tubes having a wall thickness of only six-thousandths of an inch and all of whose individual ends are expanded into a hexagonal shape, thereby allowing close nesting of tubes when packed together to form the matrix, or core, of the heater, shown in Fig. 1. A typical Cartridge copper heater attached to a steam line is shown in Fig. 2.

THE EXTRUSION PROCESS

In connection with this new product, it will be of interest to describe the extrusion process whereby these tubes are made. The process was the outcropping of a mistake made by a New York manufacturer engaged in the manufacture of small stampings. He accidentally made a punch too long, but which he nevertheless decided to try out on his punch press. To his surprise, instead of obtaining a flat bottom as he had anticipated, his finished article was a tube ¾-in. long having a flanged face. Finally convinced after repeated trials that he had discovered something new, he applied for patents on this novel method of extruding thin-walled metal tubes. Briefly stated, the extrusion of tubular bodies is accomplished by confining a metal blank within a very strong cylindrical chamber whose only outlet is through an annular opening at the bottom of the die. The size of this opening can be varied at will, so that tubes of any thickness can be made by proper proportioning the clearance or space between the die and punch.

USE OF EXTRUDED COPPER TUBES IN AIRPLANE RADIATORS

This process was perfected and used by the United States Cartridge Company during the great war for the manufacture of rifle ammunitions, and contemporaneously, the army and navy air service-

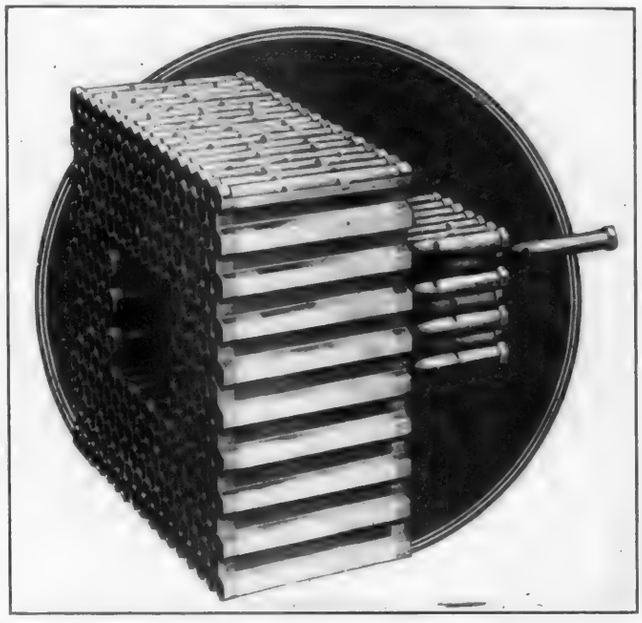


Fig. 1—Matrix or Core of Cartridge Copper Heater.

departments, realizing the advantages of airplane radiators made from extruded copper tubes, incorporated the use of these tubes wherever possible in the designs of their new airplanes. Incidentally, up to this time, no other means for cooling the water in an airplane has been developed, which is as efficient in B.T.U. removed per unit of weight or cubic content as a radiator made up from these tubes.

After the war, new uses were sought for copper tubes made by this extrusion process, and since these tubes seemed to function particularly well when made up as heat exchangers, intensive experiments and tests were conducted by the company, with the result that this type of heater has been brought up to its present stage of efficiency.

ADAPTION OF TUBES TO INDIRECT HEATERS.

In the extrusion process pellets or discs ⅜-in. in thickness are first cut from a pure copper rod ½-in. in diameter. After annealing these discs, the metal is displaced from the center to the outside walls in two successive stages. The original flat disc now has the appearance of a cylinder of which one end is closed and is now ready to be extruded. In this operation the mental slug or cylinder 9/16-in. high is fed to a press having a 2-in. stroke. In one operation the finished product, a thin tube of 6/1000-in. average wall thickness and from 9 to 12 in. long emerges.

After having been extruded, the tubes are next cut to the desired length and are then passed through a machine which expands both ends into a hexagonal form, at the same time forming the indentations which project into the air stream. Extensive tests have proven that these indentations, or "air baffles" as they are commonly called, serve the purpose of creating an air turbulence or scouring effect along the walls of the tube, yet with a scarcely perceptible increase in friction at the air velocities used in the heating and ventilating field. It is possible, by means of these indentations, to obtain an increase of approximately 30% in B.T.U. dissipation, at an air speed of 1200 ft. per minute, over the same tube with perfectly plain or smooth walls, yet without adding to the weight.

The tubes are next packed into a frame of any desired size preparatory to their being dipped. In this packing operation, each tube sets into the hexagonal opening formed by adjacent tubes so that a support is extended each tube upon six sides, or completely around its perimeter. Bearing in mind this construction, it can be seen that in the subsequent dipping operation, wherein the assembled matrix is dipped into a special alloy, this alloy serves as a gasket to prevent leakage and is at no time subject to any shearing stresses.

The dipping operation consists in immersing the assembly of tubes in a bath of molten alloy to a depth slightly greater than the length of the hexagonal end of the tube (usually 3/16 in. or ¼ in.). Tanks or headers are then brazed to the core and the whole assembly, after testing, is ready to be installed.

THE FINISHED MATRIX

A cross section of the finished matrix or assembly is shown in Fig. 3. It will be noted that steam or water is free to circulate around each tube and is not confined to a definite passage in its travel from the top to the bottom. The path of the air travel is as follows: Air from the blower or fan enters through the core and, after being deflected from side to side of the tube by "baffles" or indentations, leaves at the rear.

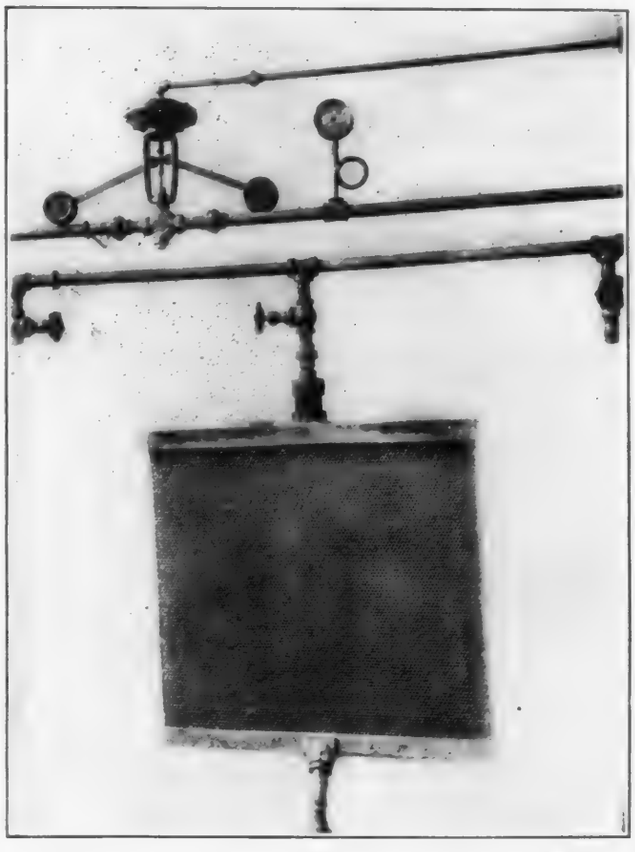


Fig. 2—Typical Cartridge Copper Heater Attached to Steam Line.

This construction permits every part of the tube to be in contact with steam or water at its inner surface and also with the air at its outer surface, i.e. there is almost 100% of direct or prime radiating surface. This is conducive to efficiency in rate of

heat transfer, due to the very short path (0.006 in. wall thickness, through which it is necessary for the heat to travel before being transferred to the air. The fact that these tubes are made of pure copper, the thermal conductivity of which is eight times that of cast-iron and six and one half times that of wrought-iron is, of course, a large factor in the high rate of B.T.U. transfer which is obtained.

While it is beyond the scope of this article to render an elaborate technical treatise on the characteristics of this type of heater, the following comparative data of interest to heating and ventilating engineers as illustrating the possibilities and uses of this type of heater when lightness of weight, small air friction losses, small space occupied per unit of heating surface and ease of handling are the prerequisites.

This heater has a direct extended or

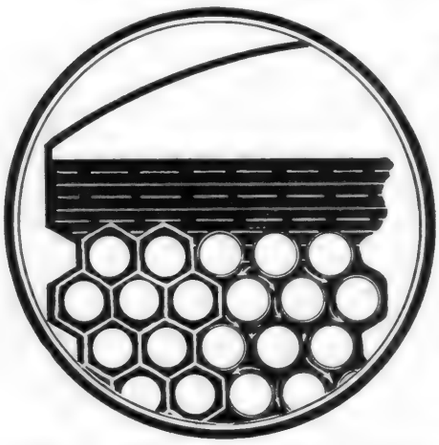


Fig. 3—Cross-Section of Finished Matrix, Cartridge Copper Heater.

radiating surface of 110 sq. ft. per cubic foot of space occupied. The heating surface mentioned throughout this article must be understood to mean that in the tubes alone, and does not include the relatively small amount in the headers, fittings, etc.

These heaters complete with all fittings weigh from 0.39 to 0.54 lb. per square foot of prime or extended surface. By this term "prime" or "extended" surface is meant the amount of radiating surface of these tubes directly projecting into the air stream. In these heaters, there are approximately nine tubes per square inch of frontal area, each of which has an inside diameter of 0.3 in. The perimeter of each tube multiplied by its length, plus the relatively small developed surface afforded by the hexagonally-expanded ends give the prime surface of the tube, and this result, multiplied by the number of tubes in the core, equals the direct radiating surface of the core.

Cartridge copper heaters are furnished in depths ranging from 8 in. to 2 in. These heaters, according to the manufacturers' data, have a B.T.U. transfer rate per hour per square foot of surface per degree temperature difference between mean steam and incoming air temperature of from 8.5-9.35 to 14.4-19.6, the first figure of each series representing those heaters composed of tubes 8 in. long and the last figures of tubes 2 in. long. The first series represents an air speed of 1000 ft. per minute through the core and the last series 2400 ft. per minute.

Air friction loss is low at any speed due, in a large measure to the amount of free area obtained in these heaters (62%) and it is also remarkable that the curve of friction loss for this heater is relatively much flatter at higher air speeds.

The air temperature rise, being a function of the B.T.U. transfer rate is notably high.

The question has at times been asked, "Are you troubled with water or steam hammer?" One of the characteristics of this type of heater is its flexibility, and because it is flexible or elastic enough to absorb all blows of this nature, the company states it has not yet heard or seen evidence of any hammer at any pressure within the limits of the capacity of the heater.

This heater, of course, is designed primarily as a low-pressure unit, i.e. 10 lbs. maximum working pressure, and as such it has lent itself to those blast heating installations wherein the steam pressure rarely goes above 5 lbs.

Up to date of this writing Cartridge copper heaters have been used successfully for public building heating, industrial heating, drying, air conditioning and refrigeration evaporators.

New Books.

THE NEW KENT, being the tenth edition of Kent's Mechanical Engineers' Handbook, rewritten and containing no less than 2,247 pages, has been published by John Wiley & Sons, Inc., New York. For three years Robert T. Kent, son of the original author, and now editor-in-chief, and a staff of 35 engineers, have been working on this new edition. The new edition contains over 50 per cent. more material than the previous edition. Included in the matter that is new or rewritten are sections on heat insulation, thermodynamics, fans and blowers, fuels and combustion, steam, the steam boiler, refrigeration and ice making, building construction and heating and ventilation. The section on heating and ventilation bears the authorship of Louis A. Harding. Starting in with data on estimating heating requirements of buildings, largely condensed from Harding & Willard's work on the same subject, the author takes up in order, radiation, rating of heating boilers, direct steam heating, gravity indirect heating, direct water heating, warm-air furnace heating, blower or fan-blast heating systems and design of air ducts. A separate section is assigned to ventilation, with an exhaustive presentation of air-conditioning practice. The book is profusely illustrated and is printed on light paper for convenience in handling in spite of its many pages. Size 4¼ x 7 in. Pp. 2,247. Price, genuine leather, $7.00; atholeather, $6.00, postpaid. Published by John Wiley & Sons, Inc., 432 Fourth Avenue, New York, or may be obtained through the book department of THE HEATING AND VENTILATING MAGAZINE.

CALCULATIONS IN HEATING AND VENTILATION, by G. S. Coleman, senior lecturer in municipal and sanitary engineering in the Municipal College of Technology at Manchester, England, and lecturer in the Victoria University, is the title of a new book which will be found especially useciples and calculations involved in the heatful to those who wish to study the prining and ventilation of buildings. The author has included such portions of applied mechanics, physics, hygiene, hydraulics and pneumatics as he considers will be required, and has continued with chapters dealing with the data required, the experimental coefficients and the derivation and accuracy of certain standard formulas. Further chapters relate to ducts, pipes, fans, boilers, chimneys and fuels, and the methods are illustrated by worked examples in the text. Numerous examples for the use of the student are given at the end of each chapter, and numerical answers are supplied. Unlike many books published in a foreign country, the data, for the most part, apply equally as much to American as to English practice. The book owes its origin to the necessity of providing working examples in the subject for students taking the second and third years in the advanced course in heating and ventilating engineering in the Municipal College of Technology. Photographs and drawings of apparatus are not shown and the illustrations are only diagrammatic. In addition to its usefulness as a college text-book, this work will have a special value to those engaged in active practice who may not have had the advantage of a thorough grounding in the fundamentals of their work. Size 6 x 9 in. Pp. 255. Price $5.00. Published by Longmans, Green & Co., New York, or may be obtained through the book department of THE HEATING AND VENTILATING MAGAZINE.

STANDARD COSTS FOR SHEET-METAL WORKERS, by Alfred Baruch, based upon a series of articles on the subject published in *Sheet Metal Worker,* deals exhaustively with this subject. As the author states, for several years the sheet-metal contractors and progressive shop owners have needed a closer knowledge of their costs of doing business. The cost system described by Mr. Baruch is based upon methods which he devised and which are now in successful operation in a number of shops. In addition the author has incorporated the practical suggestions given him by owners of large and small shops who have successfully solved the problem of knowing what their business costs them. Size 6 x 9 in. Pp. 298.

Organization of American Association of Oil Burner Manufacturers.

A notable step forward in the fuel-oil burning field has been taken in the organization of the American Association of Oil Burner Manufacturers, including both domestic and industrial oil burner concerns. At the organization meeting, which was held in Chicago, Wallace C. Capen, of the Home Appliance Corporation, St. Louis, was elected president, and Leon D. Becker, editor of *Fuel Oil,* Galesburg, Ill., was appointed acting secretary. Temporary headquarters have been established in Galesburg, Ill., at 518 Bank of Galesburg Building, and in Chicago at 20 East Jackson Boulevard.

Cooling of Electric Generating Equipment and Central Station Buildings

Due, on one hand, to the growth of the power load, coupled with the increase in the size and rotative speed of electric generating machinery, requiring the enclosing of the larger high-speed apparatus, and, on the other hand, to the closer quarters now used for transformer and converter units, the proper ventilation or, rather, cooling of such apparatus and buildings has become of vital importance. The necessity for enclosing large electrical units is due (1) to windage noise of high-speed machinery, (2) to the need of pressure chambers in long-core machines to force air through to the center of the core, (3) the necessity of cleaning air going to large machines, (4) the comfort of operators in stations of restricted space, (5) obtaining cooler air from outside and (6) avoiding the possibility in motor generator sets of one machine taking hot air from another. The excess heat in the station building itself is very often so great as to be unbearable unless some means are taken to change the air frequently.

These conditions have led to the appointment of a special committee of the National Electric Light Association and its report, which goes exhaustively into the subject, has now been published. It is a pamphlet of 46 pages and reflects much painstaking care and thoroughness on the part of the subcommittee, which was headed by N. Stahl and included in its personnel F. R. Ellis of the B. F. Sturtevant Company.

In presenting the subject, the report points out that the ventilation of electrical apparatus is to be distinguished from general ventilation which contemplates the removal of not only heated air, but moisture and fume or dust-laden air. In reality ventilation of electrical apparatus, with but few exceptions, is a cooling application, and as such can be divided into two classes, direct and indirect.

In the former come such applications as the cooling of enclosed machines, such as generators, motors and transformers. The direct cooling is accomplished by forcing air through the machine so that by contact with the radiating walls of the machine heat is conducted to the air.

In the second class come such applications as cooling substations or rotary rooms. This is an application that is usually termed "ventilation." It is indirect cooling because the machine radiates its heat to the surrounding air and the surrounding air is removed and replaced by outside air.

Inasmuch as diffusion prevents the absolute removal of every cubic foot of air and its replacement by outside air, ventilation becomes a dilution process and because of this the results obtained will be dependent upon the degree of dilution.

In many respects, states the report, we are both fortunate and unfortunate in the medium of air for cooling and ventilating. We are fortunate in that the supply is unlimited and costs only for the handling; we can handle large volumes for a small expenditure of power; advantage can be taken of natural convection currents to secure the movement of considerable volumes of air. We are not so fortunate in its low specific heat which at constant pressure is usually given as 0.2375. This, coupled with the specific weight of 0.075 lbs. at 65° F. requires the use of a large volume of air to absorb a smal quantity of heat. In fact $\frac{1}{0.2375 \times 0.075}$ or 56 cu. ft. heated through 1° F. are necessary to absorb one B. T. U. Air supports combustion which makes it undesirable from an electrical standpoint. Still air is an excellent non-conductor of heat, and to be effective for cooling the air must be kept in motion. Most unfortunate for its use with electrical apparatus is the solid matter that it carries in suspension. In spite of its many drawbacks, concludes the committee, there appears at present no simpler or more economical means of cooling much electrical apparatus than by the use of air.

Because it requires 56 cu. ft. heated through 1° F. to absorb 1 B. T. U., the volume of air necessary to cool a large generator becomes enormous and may amount in thirty or forty minutes to a weight equal to that of the generator itself and more than the weight of steam supplied to the turbine to drive the generator To move such a weight at velocities from 1000 ft. per minute to more than a mile a minute requires the expenditure of considerable power.

Notes on Concrete Duct Construction.

As the committee states, in many generating and substations air ducts are constructed of concrete and special attention is called to the porosity of average concrete. When such construction is used for air ducts in which pressures of several inches of water will be maintained, the committee recommends that the interior be coated with neat cement and painted with a good oil paint. According to figures used by the B. F. Sturtevant Company, the average friction loss in concrete may be figured at a pressure equal to the velocity pressure in 20 diameters for smooth concrete, and as low as 15 diameters for rought concrete.

Importance of Easy Air Flow.

Another point emphasized in the report is that inasmuch as most air handling systems are working at iow pressures, care must be taken to permit an easy flow. In the case of steam moving at several thousand feet per minute and at pressures of 200 lbs. and more per square inch the loss due to a sharp right-angle elbow is not of much consequence as it is a very small percentage of the total pressure in a pipe system; however, the loss due to a short right-angle elbow is equal to the velocity pressure and that may be from 10% to 25% of the total pressure of an air duct system.

Air Requirements for Electrical Machines.

The amount of air required by a large machine as given in the report, varies from 75 to 100 cu. ft. per minute per kilowatt loss; the lower range being used for large high-speed turbines, while the upper range is for slower-speed units. The amount of air is dependent upon the air temperature rise through a machine and usually varies between 18° and 24°. The greater the amount of air circulated, the lower the air rise, and the lower the hot spot temperature. The hot spot temperature is the machine rise above the temperature of the leaving air, so the temperature rise of the air going through the machine enters directly into the total temperature.

The air for the great majority of enclosed machines is obtained and propelled through the machine by fans fastened to the rotor. The inlet and outlet ducts must be short, having few bends, of liberal radius, and of ample cross-sectional area.

The pressure drop varies in different classes of apparatus. Ten to twelve inches of water pressure is required in a turbo-generator while only 1 to 2 in. are required in synchronous converters, synchronous motors and D. C. generators. For other classes of apparatus, especially where external blowers are not used, air velocities should be kept low, not to exceed 1000 ft. In self-ventilated, enclosed machines, the velocity of air in the air ducts ranges between 1000 and 1500 ft. per minute. For force-ventilated machines, with separate blowers, the air velocity in the ducts may be increased to between 2000 and 3000 ft. per minute.

The report illustrates methods of enclosing A. C. turbo-generators vertical water wheel generators, horizontal water wheel generators, transformers, synchronous converters, synchronous condensers and direct-current machinery, including, in some cases, diagrams of the complete ventilating installation

Ventilation of Substations

In the ventilation of substations an idea of the air volumes required is gained by the statement that in a station of five 4000 K. W. converters, based on 12,000 cu. ft for each transformer, and 25,000 cu. ft. for each rotary converter, the amount of air needed is 185,000 cu. ft. per minute. All of this air must be handled mechanically and must be taken from points insuring reasonable cleanliness.

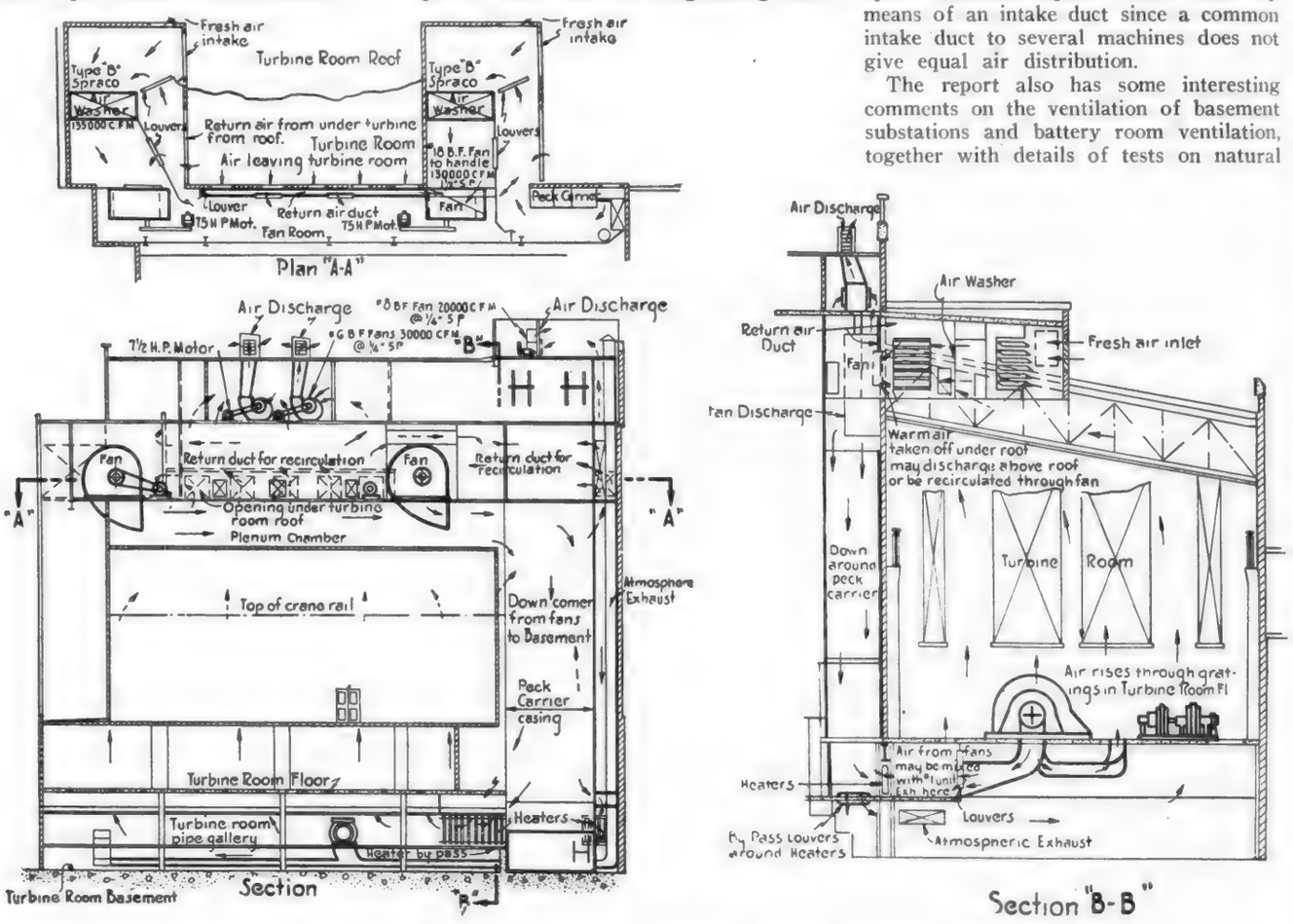
In order to guarantee each piece of apparatus its proper quantity of air, individual blowers must be introduced at each machine and a general system of exhaust must be introduced to prevent these individual blowers working against an abnormal pressure in the room.

In many of the designs of the recent stations the report adds, it has been found possible to provide a space in the base-

* Abstracted from a report of the Subcommittee on Ventilation of the Electrical Apparatus Committee, Technical National Section of the National Electric Light Association, published October, 1923, under the title of "Ventilation of Central Station Buildings and Equipment."

ment near the point of admission from the rear of sufficient size to introduce an air washer. No air washer, however, has as yet been introduced and the question is still being debated as to whether an air washer will be required at any time.

An effort is made to so design the inlet that an average maximum velocity of 1200 ft. per minute will be insured.



Method of Ventilating Power House of Detroit Edison Company at Marysville.

Movement of Air in Machine Room

The heated air from the various machines rises directly over each machine to the ceiling and the exhaust system must be so designed that this heated air can be picked out at various locations near the ceiling. Unless this be done, portions of the rooms, particularly those remote from the front openings, will be abnormally heated and the machines in the rear of the room will feel the effects of the high temperatures of the atmosphere of the room.

Duct Construction

The air duct in the rear leading into the fresh air chamber in the basement prevents the installation of windows and the only natural opening to the outer atmosphere is in the front of the room, which in hot weather is kept opened by the station operators. If the exhaust system which is frequently taken up in the front of the building is not distributed over the entire area of the room by means of ducts, there is the short circuiting of air from the front doors and windows directly into the exhaust duct, thereby defeating the purpose of the exhaust.

Precaution To Be Taken in Locating Vents

The warm-air exhaust through the roof fans is in many cases discharged at points lower than the neighboring buildings and in the summer time when the windows are kept opened and the air is particularly warm, great care must be used to prevent annoyance to the neighbors. The exhaust must, therefore, be carried as nearly vertical as possible and located after carefully surveying the neighboring conditions.

Good results are often obtained by exhausting through holes in the roof without the introduction of pipes or ducts projecting above the roof. This removes the imaginary annoyance which the sight of an exhaust head might produce.

Muffling of Exhaust Air

If the discharged air is delivered at a very high velocity, a very disagreeable noise is sometimes produced which annoys adjoining tenants, particularly at night time, and efforts have been made to provide a muffler which will not decrease efficiency.

Experiments made by lining the exhaust chamber with sound deadening brick or sound absorbing material have been made but results hardly warrant any great expense in this line. If the air be exhausted into a large chamber, which in turn vents.

The conclusion has been reached that the ventilating problem for new machines can best be solved by providing a closed system on the discharge side which, of course, will call for vent ducts and exhausting fans; and further, that the intake air to the unit should be drawn from the open substation space rather than by means of an intake duct since a common intake duct to several machines does not give equal air distribution.

The report also has some interesting comments on the ventilation of basement substations and battery room ventilation, together with details of tests on natural ventilation of substation equipment made by the Cleveland Railway Company.

Satisfactory relief from noises in substations, states the report, has been found by enclosing the offending piece of machinery in a separate room and discharging its air through the roof.

Another section of the report discusses the use of radiator type coolers for removing the heat from the ventilating air. The two concluding sections are devoted to "Duct Design for Mechanical Draft," with numerous air duct tables; and Ventilation of Electrical Machinery with special reference to the various types of fans applicable to this work, such as the centrifugal cased and axial flow or propeller type, the straight blade or radial blade type, the forward-curved multiblade type, and the fully-curved backward type, as well as the propeller and disc types. Under the same heading is discussed the use of air washers for washing and cooling the air supply for ventilating electrical apparatus which, it is noted, are almost entirely of the spray type, at least in this country, and dry filters (fabric) which are used to a large extent in European

stations. The report also takes note of the development of viscous surface filters and emphasizes the importance of keeping them clean. It is usual, states the report, to have a few extra filter cells for a large installation so that the cells can be cleaned one at a time. By replacing a dirty cell with a clean one continued operation is possible.

Annual Convention of American Gas Association.

Some pertinent comments on the status of gas for house heating purposes were made by President R. B. Brown of the American Gas Association in his address before that body at its annual convention in Atlantic City, October 15-19, and reported in the *Merchant Plumber and Fitter*, of New York.

After referring to the controversial nature of the problem, he made the statement that house heating with gas was not to be expected by this generation unless the entire present method of charging for gas service was discarded and an equitable, scientific rate structure substituted, permitting gas companies to charge each class of gas users for the specific service demanded, whether for cooking, lighting, heating, or industrial work.

As he pointed out, the present system of charging for gas has not been revised since the beginning of the use of manufactured gas, yet the uses of gas has now become varied in a thousand ways. He characterized present rates for gas service as unfair and discriminatory against the average family and favorable to the wealthier class who use little gas. The rank and file of users, he said, pay more for their gas service than a growing minority group of favored customers who do not use enough gas to pay for the cost of delivering it.

"With scientific rates in force, house-heating with gas will be a luxury—well worth its cost in convenience and sanitation to those who can afford it," he said. "I believe that the gas industry will be surprised at the amount of house-heating which will be requested on the basis that such users will be required to pay for the actual cost of service."

Stating that gas companies which seek house-heating on faith as to some hypothetical developments, and on rates less than the true cost of service surely court disaster, he said that with house-heating, the proportion of time that the gas plant equipment is idle will be greatly increased. The fixed cost, such as taxes, interest and depreciation, will be three times as great for house-heating as for present average use and as a result under present forms of rates, gas service charges will have to be increased for all people. But if the equitable rate is introduced, and those who want house-heating can be properly charged for this special service, then gas companies can safely meet the requests without increasing the rates to their customers in general.

"The gas industry faces its most assured future," he said. "In spite of increased cost of coal and other material, the gas industry during the year gave very close to 100% service. Its rate did not nearly approach the increases in almost every necessary item contributing to the average family's living expenses. We must continue to strive to keep gas service the cheapest item of the daily necessities of life. What we have done most emphatically gives the lie to the slams, which have been handed the gas industry and its personnel."

An attendance of nearly 3,500 was registered at the convention, the principal feature, as in previous years being the exhibit of gas appliances and apparatus on the Steel Pier.

Precautions to Be Taken in the Use of Fans with Gravity Warm-Air Furnace Heating Systems.

Some thoughtful comments on the use of fans in connection with warm-air furnace heating systems, based manifestly upon practical experience with these devices, are made by E. E. Zideck, in the *American Artisan* for October 20, in a discussion of this subject. Mr. Zideck's comments are in answer to a correspondent of that journal who took issue with a statement that "the use of fans in connection with a furnace is not a solution of the problem." Mr. Zideck makes the point at the outset that the use of a fan in that connection changes the system to a mechanical one, even if the fan used works automatically. As he states, the idea of securing greater velocity and greater volumes of air in this way is not new, having been used, for instance, by him as far back as 1912. In a case he cites, he had a fan in connection with a furnace placed below the stage floor of a theatre, in which the auditorium floor was on a level with the furnace base and gradually rose. The furnace, by that fan, was made to heat the building and ventilate it at the same time, but it was impossible to prevent ashes and, when the firing apparatus became leaky, gases and smoke from being carried along with the strong current of air.

"The manufacturers of the welded furnace," continues Mr. Zideck, "claim that their furnace is tight under all conditions, which is believable, and that no ashes or smoke can enter the casing except when it is leaky and permits smoke and dust from the cellar to enter it. With this kind of a furnace and with a perfectly tight casing around it, the suction produced by a fan could not draw dust and smoke. But if these prerequisites do not exist, then the use of fan with the furnace would certainly accelerate the draft for the dust to enter the casing, and the smoke or the gases from a leaky furnace to more readily follow the least resistance—in this case either the air moving away from the furnace or the vacuum created by a current of air moving away from a solid object, the furnace."

Mr. Zideck also makes a distinction between a fan-equipped warm-air heating system, designed as such, and a gravity system, with a fan attachment. In the mechanical system, he points out, the arrangement of ducts is not governed by the rules applying to the gravity system. The ducts, both feeding and discharging, may be laid horizontally or even up and down, as it does not matter in a system which by mechanical means draws the air in and forces it out.

In conclusion he endorses the practice of installing an auxiliary fan in a gravity system in cases where there is difficulty obtaining air flow through some of the risers.

First Annual Meeting of The American Construction Council

Among the problems discussed at the first annual meeting of the American Construction Council, of which Franklin D. Roosevelt is president, were local autonomy and national organization in the construction industry, apprenticeship, vocational guidance and craftsmanship, reduction of unemployment, and research program of the council.

Resolutions adopted included one authorizing an expenditure up to $25,000 to be used in promoting organization of local building construction congresses throughout the country and to co-operate with those already existing; another directing council committees to co-operate with employees' and employers' organizations, in providing for apprenticeship which will be attractive to young men and will produce skilled workers in the construction industry; and a third directing the executive committee to keep in touch with conditions pertaining to construction throughout the United States and if, in its judgment a crisis arises, to convene as many members as possible and issue a statement to the public for its information.

In a statement made public October 22, Mr. Roosevelt urged that all possible work such as maintenance and repairs be done during the winter months in order to give employment during the closed season and also to avoid a possible shortage of labor and materials in the spring when building operations are on a larger scale.

He announced also that the council would be glad to direct young men, desirous of entering vocational schools, to schools best adapted to their needs.

The meeting of the council itself followed a morning session of the Board of Governors at the home of Mr. Roosevelt. D. Knickerbocker Boyd, executive vice president, acted as general chairman of the council meeting and delivered an address in which he reiterated the purposes for which the council was formed and the major lines of activity along which it should operate.

The subjects of apprenticeship, vocational guidance and craftsmanship were presented concretely by men familiar with those subjects, including Fred F. Moran, managing director of the Apprenticeship Commission of the New York Building Congress; Dr. J. C. Wright, director of the Federal board for Vocational Education; George Dautel, chairman of the apprenticeship committee for bricklayers, Cleveland, O.; James M. Gauld, vice president of the Boston Building Congress; and Col. F. M. Gunby, of the Boston Building Congress.

Group Heating as the Next Forward Step in the Progress of the Art

By H. C. Kimbrough

Secretary, American District Steam Company.

THERE is nothing so essential to "Life, Liberty and the Pursuit of Happiness" as a tranquil mind and creature comforts. Now the very beginning and foundation of our physical well-being is and always has been in the temperate zone, HEAT, and the degree of ease with which this prime necessity is supplied to mankind becomes the measure of his comfort and tranquility.

But we have not come very far in developing the manner, means or methods of securing this essential, have we, when we recall the vivid picture of the Indian, sitting around a fire built in the center of his primitive tepee, the flap of which is opened to permit the smoke to go upward, the while he plans moving on to his next temporary residence, or promotes excuses for more war paint. And do you know, it is barely possible that smoke in the eyes has had much to do with engendering hatred, and bloody battles thereafter, all of which we charged to savagery or general blood thirstiness, while as a matter of fact it may have been violent reaction to uncomfortable heating methods, then as now.

Later on, we had our thrill over the picture of the soldier, warming his back and his face at a fire on the ground. And planning more battles;—again suggesting idea that war will not cease so long as we continue our antiquated methods of heating. A heat complex, then, as our collegiate person puts it. You have had a few domestic engagements yourself with wife, man or maid servant about the heating of the premises, because of the dust, dirt and attendant annoyance, unless perchance you have had the good fortune to have heat at your disposal via the valve in the basement, from a central steam plant.

The point of the statement, that we have not come very far in our manner and method of heating, is that the greater percentage of the world population is still "backing up to the fire," or giving loud cheers over the fact that a large base burner has been perfected, one which will require coal, with resultant ashes all over the house. The cheering grows louder when the base burner is ousted and into the cellar is placed the last word in a boiler,—the point of difference being that when the coal is poured into the stove, in the front room of the house, you can SEE the ashes go about the room, finding such place of lodgment as to cause the greatest amount of work for the woman of the house, howbeit, the man left a FINE fire in the stove, likewise a fine mess all over the premises. While in the case of the furnace or boiler in the basement, the designing engineers—let us call them designing and not crafty!—have accomplished one highly astute thing, i. e., the dirt sifts up through the floor, casements, etc., but you do not SEE IT, so everything is all right—until the announcement is made that "we will just have to clean house," which includes washing curtains, redecorating everything, restoring pictures to first color and recovering that which was lost or covered up, due to the continuing primitive methods of heating.

Again I repeat, we have not come very far in our methods of heating, and it may be interesting to work out a single problem of the application of "Group Heating of Buildings," which is the subject suggested by your program committee.

BLOCK HEATING DEFINED

The subject of group or block heating, and the application of the principles of community or group heating in cities large and small, have led to a desire to ascertain the smallest divisible unit of operation which can be successful commercially. For this purpose a detailed investigation of the engineering and commercial factors was promulgated, and I am indebted to Walter J. Kline, of the American District Steam Company, for his engineering study of this very interesting problem of group, or community heating.

STUDY OF PLANT DESIGNED TO SERVE TWO RESIDENTAL BLOCKS

The chosen field for observation included two well-built residential blocks in a city on the Lakes, comparable in every way with districts in Cleveland, and in this report were discussed all of the items involved in the inception, organization, design, construction and operation of a district heating proposition, confined within the limits of a community or block plan.

The most important of these items were:

- Proper selection of block or district.
- Volume of space to be heated.
- Amount of heat required based upon recorded data for similar latitude.
- Design and cost of proper boiler plant.
- Discussion of return system and cost.
- Method of operation, meters, etc.
- Cost of operation.
- Fixed, depreciation, and maintenance charges.
- Revenue to be paid by members of the community.
- Surplus to be paid to participating shareholders.

CONCLUSIONS BASED ON ORIGINAL STUDY

The original study included a number of items which have been checked and revised as a result of conference and discussions, as well as a review and checking by other engineers and individuals who were interested.

(1) By running a single steam main with long services, instead of a "loop" with short services, it was found that the cost is reduced somewhat and these figures are used in the estimate herewith.

(2) The value of the water plus the value of the heat in the condensate is insufficient to justify the required investment in return mains.

(3) An ornamental stack can be constructed which will be sufficiently attractive to be proof against reasonable objections. It will add to the cost at least $1,000.00 which has been included in the revised figures.

(4) In a study of a community or district heating plant, in St. Louis, the idea was proposed of building a community garage with capacity for 15 cars, in which would be located the boilers, likewise room for storage of coal. On the scond floor it was proposed to equip an apartment for the man who would be in charge of the garage and the firing of these boilers. Such a building would cost roughly $25,000 to $30,000 and the rent of garage space would more than provide interest and return on the combined community boiler plant and garage.

(5) From the figures we have eliminated all items of "customer's hous piping."

(6) We have eliminated "interest" from the cost of operation.

(7) The item of "coal cost" has been reviewed from the standing of assumed evaporation "steam delivered" to customer on efficiency of operation. Oil burning is out of the question at this time, because of the cost of oil.

(8) It is quite evident that clerical labor, superintendent, fitter, etc., if charged to a single block, will result in a disproportionate overhead. The same organization can look after many blocks, and therein lies the desirability of including ALL the desirable blocks in a district rather than a restricted community. The matter of depreciation and maintenance has been reviewed and is established for the purpose of this analysis as follows:

Maintenance—general ....2% of the total
Maintenance—boilers 2.00 per h. p. per year.
Depreciation .....4% of the total
Insurance and taxes .....2% of the total

COST OF CONSTRUCTION AND OPERATION

The following, then, is the statement of cost of construction and operation of a single unit, or block plant. It consists of 42 residences, 4 apartment buildings, one club and nine garages, aggregating 3,630,000 cu. ft. of space, which will require an annual average of 38,090,500 lbs. of steam condensed in radiators and house piping Based upon an evaporation of 6¾ lbs. of water per pound of coal and an "efficiency of delivery" of 85%, there will be metered 5¾ lbs. of steam per pound of bituminous coal burned, or approximately 3,300 tons.

Hundreds of community heating plants may be installed throughout the country on the co-operative participating plan, and made self-sustaining, with a fair return on the cost, and providing for upkeep and renewals.

ADVANTAGES OF PLAN

Financially the desirability of pooling the cost of installation and operation of many individual boiler plants, and constructing and operating one central plant, is evident. Why not do away with the annoyances of getting coal, handling ashes, and depending upon irresponsible attend-

nts? Why not have one smoke stack instead of a multitude? Why not enjoy a clean community free from the smoke nuisance and its damage to property and furnishings?

A very worthwhile item to consider in the presentation of community or district heating is the avoidance of coal shortage, in advance of the heating season. The unloading of coal in the basement of the individual house represents a very considerable tying up of money which earns nothing during the winter season.

INVESTMENT AND OPERATION

Cost of 300 H. P. boiler plant and stack			$36,000.00
Cost of steam distribution system (including trenching)			38,000.00
Cost of meters and valves			3,750.00
Total cost of construction			$77,750.00
Cost of coal—$6.00 per ton		$19,800.00	
Cost of teaming coal and ashes		3,300.00	
Depreciation, maintenance, insurance and taxes,—(8%)		6,210.00	
Maintenance, boilers, etc., $2.00 per H. P.		600.00	
Cost of water		500.00	
2 firemen— 8 months	$2,240.00		
1 chief 12 months	1,800.00		
1 meter man and Clerk	800.00		
Miscellaneous expenses	250.00	5,090.00	
Total operating, fixed and labor charges			$35,510.00
Income from 38,090,500 lbs. of steam if sold at sliding scale of rates, approximately $1.31 per thousand pounds (coal $6.50 teamed to power plant) total sales			$49,898.00
Operating charges, forward			35,510.00
Surplus over operating			$14,388.00
Percentage on investment, ($77,750.00) 18.5%			

The foregoing results are based upon 100% of the existing buildings participating in the community, or block plan of heating, and it becomes at once apparent that the greatest possible "load" should be secured to insure the maximum return on the investment.

OPPORTUNITY FOR CONSULTING ENGINEERS

From the standpoint of the consulting engineer, the COST of a plant or production should not weigh against the desirability of community heating service. The countless community centers in which there are six, ten, a dozen or twenty property owners,—whose chief concern is the comfort of dependable heating service and who are able and willing to pay a reasonable charge for the privilege,—would be the consulting engineers' field for development of community heating plants. Every building having at present a heating boiler has a potential beginning of an argument for a community or block plant, because the longer the owner operates this separate unit, with its separate upkeep, labor and annoyance, the more certain is the possibility of interesting him in "buying his heat" from a central community plant, through properly installed underground heating mains; just as has come to be the custom of having water through pipe, gas through pipe, and electricity by transmission into the house, apartment or business building.

We have "backed away" from this very interesting study and development long enough, it would seem, and it is clearly a wide and almost unexplored field of substantial return to the consulting engineer, nd his collaborator, the architect.

John Bidwell Blake—An Appreciation

The many friends and admirers of the late John Bidwell Blake, for twenty-five years head of the mechanical engineering department of Holabird & Roche, architects, Chicago, will appreciate the service rendered through the Western Society of Engineers in issuing a sketch of his career. This sketch was prepared by a committee consisting of Henry J. Burt, Frank B. Long and J. A. Sutherland.

In estimating Mr. Blake's service to the profession, the committee states that he should be known as a pioneer in the special work of the mechanical engineering features of buildings, adding that he was probably the first mechanical engineer in Chicago to devote his whole time to this line of work and to develop it as a specialty.

During the period of his connection with Holabird & Roche, as the sketch points out, the mechanical equipment of buildings has grown in importance and complication as the construction of high office buildings and great hotels has developed, and the demand for greater and better service has increased. While this line of work is a special one, its scope is broad, embracing as it does, drainage and sanitation, lighting, heating and ventilation, refrigeration, steam and electric power plants, water supply and distribution, elevators and other hoists, telephone and signal systems, and in some instances special apparatus for manufacturing processes. Each of these items has become of enough importance to be the work of a specialist.

Mr. Blake has to his credit the design and installation of the mechanical apparatus in some of the best equipped buildings in Chicago, such as the City and County Building, Lumber Exchange, La-Salle Hotel, McCormick Building, Stevens Hotel (proposed), Otis Building, Crerar Library and Apollo Theatre. His independent power plants and air washing and cooling systems are models of efficiency.

Mr. Blake became interested in this line of work through his college classmate, Frank B. Long, who was then chief draftsman for Holabird & Roche, and these two friends continued their association, Mr. Long still being with this architectural firm. It happened that Mr. Blake was ill at a hospital. On one of his visits to the hospital Long suggested that Blake undertake the organization of the mechanical engineering work. Mr. Blake accepted, and thus began the important work which he carried on so long.

Aside from an occasional vacation period, the only break in his service was during the war. In December, 1917, he went to Washington, where he was mechanical engineer in the Engineering Branch of the Construction Division of the Army. His most important work there was in consultation and designing on cargo handling apparatus at port terminals, process equipment for some of the War Department's Industrial Plants and Power Plants. He was commissioned as major, Q. M. C., in January, 1918, and held this rank until discharged in 1919.

Being of a studious disposition, Mr. Blake was at all times well informed on the progress in his profession. He had the ability to discern with assurance the merits and the defects of plans and apparatus submitted to him, so that he was ready to use new apparatus or new ideas if they had merit, and equally ready to refuse them if they had defects. In the interest of his profession it is to be regretted that he was not an author as well as a student. He had a thorough knowledge of his work and his educational training fitted him to write. The nearest approach he made to a contribution to engineering literature was his specifications. It would be a worthy task for one of his professional brothers to compile a text book from these specifications.

Mr. Blake was a graduate of the University of Illinois with the degree of M. E.

Verdict for L. F. Ostrander in Heating Specialty Suit

A judgment for $10,000 was awarded by the Circuit of St. Louis, October 11, in favor of L. F. Ostrander, vice-president and general manager of the O-E Specialty Mfg. Co., Milwaukee, Wis., in connection with an infringement suit instituted by him, some five years ago, against Ferdinand Messmer and Joseph Messmer, president and secretary of the Continental Brass & Foundry Co., of St. Louis, and Joseph G. Klemme, president of the Eagle Foundry Co., Belleville, Ill. Mr. Ostrander was formerly connected with the Continental Brass & Foundry Company, manufacturer of heating specialties, and was the inventor of the Little Hercules heater, manufactured by the Eagle Foundry Company. On the first trial he was rendered a judgment for $7,500.

The case was appealed to the St. Louis Appellate Court, and on a techincality was returned to the Circuit Court of St. Louis for a new trial. The verdict in Mr. Ostrander's favor was unanimous.

Government Inaugurates New Smoke Abatement Campaign

Renewed activities by civic authorities and organizations in the campaign to eliminate the smoke nuisance are reported by the Department of the Interior following a study of the problem of smoke abatement made by the Bureau of Mines. This campaign was suspended during the world war, when most of the smoke ordinances throughout the country were held in abeyance with the intent of allowing industries to operate unrestrictedly during the time when maximum production was necessary. With the return of normal conditions many cities have shown a determination to take up this matter seriously and work out a solution. Some 50 or 60 cities in the country already have smoke ordinances.

In domestic furnaces, according to a statement issued by the Bureau of Mines, it should be possible to reduce smoke from 50% to 75% without spending any money for additional equipment or without change in anything except the methods of handling the fuel. At industrial plants, smoke prevention is merely a matter of management, engineering judgment and designing skill.

Any operation requiring fuel can be conducted without objectionable smoke, and yet use bituminous coal in some form, states Osborn Monnett, consulting engineer of the Bureau of Mines, who conducted the investigation. If smoke abatement were merely an engineering problem it would present no difficulty. Experience has shown, however, that the problem is not so much an engineering as a psychological one. Until the public is thoroughly roused, demands smoke abatement, and shows continued interest in it, no permanent improvement is possible. Thus the part played by civic organizations and other bodies interested in bettering conditions is of high importance.

IMPORTANCE OF ABATING RESIDENCE SMOKE.

Residence smoke, while making probably less than 10% of the total smoke of a city, is particularly objectionable because it is produced in the section where its damaging possibilities are at a maximum. The smoke is discharged at a comparatively low level as distinguished from the high chimneys of a factory; hence it drifts into the windows and throughout the residential territory very annoyingly. Moreover, smoke and the distillation products of high-volatile coal burned in the low-temperature fire of the average domestic plant are much more objectionable than those of the same coal burned in a high-temperature fire, such as the furnace of a high-pressure power plant.

Such smoke has a serious pathological aspect in addition to its destructive effect on property. Acute lung diseases, such as pneumonia, bronchitis, and pleurisy, are affected by these corrosive fumes to a marked degree. Investigators agree that there is a direct relation between a heavy smoke-laden atmosphere and the morbidity of the population; moreover, it tends to lower efficiency and increases crime and suicide.

Experiments conducted by the Bureau of Mines at Salt Lake City showed that a tremendous improvement can be made in the smoke performance of domestic furnaces if the firing is done with intelligent care. In the bureau's tests minimum smoke conditions were obtained when various types of boilers and furnaces were fired by what is known as the "coking method," by the "alternate method," and by the ordinary method of firing. One novel idea advanced is the starting of fires from the top, the coal being placed immediately upon the grate with a layer of paper just above the coal and with kindling on top of the paper.

Oil-burning systems offer another method of reducing residence smoke. Most of these systems are automatic.

Prepared fuels offer another possibility for reducing smoke. Of these, coke is probably the most feasible. The use of coke fuel in residences not only helps to eliminate domestic smoke, as coke can be burned smokelessly in ordinary furnaces at all times, but aids the conservation of natural resources. The probability is that sometime a large proportion of the coal used for residence purposes will be carbonized; thus valuable by-products will be recovered before the fuel is burned.

CHIEF SOURCES OF INDUSTRIAL SMOKE.

High-pressure plants that produce power for miscellaneous manufacturing establishments are the chief sources of industrial smoke. Most of these plants are hand-fired and consist of comparatively small units, approximately 150 H.P. each. Since they make so much of the smoke of the average city, smokers of this class have received most attention, and engineering information on such plants is more widely distributed and more thoroughly standardized than other literature dealing with smoke abatement.

Stoker-fired plants have perhaps been most successful in smoke abatement. The boiler units are generally of large size, are equipped with mechanical stokers, and have been carefully designed by competent engineers. In addition, these plants are under constant supervision by skilled engineers, and firemen are always in attendance.

A person investigating the smoke problem is sometimes surprised to find what a large amount of the total fuel used is burned in special furnaces which have no relation to steam making. Some of these furnaces—annealing ovens, for example—are among the worst smokers with which we have to contend.

EXISTING LAWS ADEQUATE TO MEET SITUATION.

Success in smoke abatement depends largely on the administration of existing laws. Perhaps the most important consideration is the type of man for administering a smoke ordinance. It seems wise to have an engineer in charge who is familiar with boilers and furnaces and who can understand the engineering problems that will arise when the ordinance is put into effect.

The results of this investigation have been embodied in a report designed to make the various technical problems necessarily associated with the subject of smoke abatement thoroughly intelligible to the non-technical reader. Copies of this report, Technical Paper No. 273, may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

Economies in Distribution

"Warehousing and Transportation Economies in Distribution" is the title of a pamphlet recently issued by the Domestic Distribution Department of the Chamber of Commerce of the United States for free distribution. The growing tendency of retailers to increase their rate of turnover through buying in smaller quantities is likely to require more convenient wholesale sources of supply, the pamphlet states.

"Storage warehousing, must be regarded in the United States today as of almost, if not equal, importance to production," it is stated. "Many manufacturers and wholesalers whose area of distribution is or may be of considerable extent, already are preparing to meet this demand for convenient wholesale sources of supply."

The pamphlet states that the day of public warehousing, operated according to efficient methods, is rapidly being approached and will tend materially to result in economies in distribution.

United States Coal Commission's Conclusions

The final report of the United States Coal Commission will contain recommendations for full publicity of accounts from both operators and miners and that the most serious problems confronting the industry be worked out by the elements of the industry itself rather than through legislative action.

The commission has released a number of reports covering its investigations of various phases of the industry, one of the more recent ones discussing labor relations in bituminous coal mining.

In that report the commission states that it did not advocate "nationalization as a means of meeting the national strike or other parts of the problem of labor relations." It recommended a check upon provocative publicity, separate and joint study by operators and union of means of stablizing the industry, joint commissions in each district and nationally to study mine work and existing rate differentials, full and compulsory publicity of rates in non-union fields, discard of sub-contracting, abolition of leasing convicts for mine work, discontinuing use of spies and the use of deputy sheriffs as company guards, and the discontinuing of the check-off for collection of fines and special assessments.

Legal Decisions

Evidence That Heating Plant Installed Under Contract With Owner Rather Than Tenant.

In proceedings to foreclose a mechanic's lien for the installation of a steam heating plant in a garage, it appeared that the garage and a house were rented from the owners, a husband and wife, by their son, as tenant at will, and that the negotiations for the installation had been principally carried on by the son. The only question on appeal from a judgment for plaintiiff was: Was there sufficient evidence to sustain the finding that the contractors installed the heating plant under an agreement with the owners? They testified to facts which, if standing alone and uncontradicted, would justify a finding that the agreement was made with the son acting for himself and not for his father and mother. This, however, was contradicted by other evidence tending to show that the son, a mere tenant at will, was acting as manager for his parents in the construction of the garage and the installation of the heating plant. The Indiana Appellate Court, Caito v. Fishman, 140 N. E. 66, held the evidence sufficient to establish a contract will the owners for the installation of the plant, and affirmed the judgment for the plaintiffs.

Rates for Steam Heat and Hot Water Service.

The Abbott Kenney Company maintains a central station boiler plant in the city of Venice, Calif., generating steam for operating fire pumps and for furnishing steam heat to 18 consumers, and hot water service to 29 customers in the vicinity. The California Railroad Commission, after hearing evidence, has approved the following general rates for steam heat and hot water service:

Steam Heat—*22½* cents per square foot of heating surface per month.

Hot Water—A. Restaurants and other commercial purposes: $6.75 per tap per month where five or less openings are served.

$0.75 per tap for all in excess of five.

B. Hotels, apartment houses, etc.,—$0.75 per opening per month where nine or more openings are served. Minimum charge, $6.75 per month.

Reasonableness of Steam Heating Rates—Test Rates—Apportionment of Valuation and Operating Expenses of Joint Steam Heat and Electric Plant

The Missouri Public Service Commission and the Kansas City Light & Power Company appealed from an order of the circuit court, setting aside an order of the Commission fixing rates for steam-heating service to consumers in Kansas City. Besides supplying electricity to the city, the company furnishes steam heat to a small area in the business district. This is furnished from four plants, three small ones, exclusive heating plants, and one large joint steam heat and electric plant, which supplies about two-thirds of the steam heat furnished. At this plant substantially no electricity was made unless there was at the same time demand and use for all the exhaust steam in the heating service. The commission, in apportioning the valuation and operating expenses of the property in this joint plant, for determining rates for steam heat and electricity, allocated 85%, as properly chargeable to steam heat and 15% to electricity, in accordance with the heat units in the steam used for each service. The circuit court set aside the order on the grounds that the valuation and expense of the joint plant should have been apportioned equally, 50% to each service; that the commission did not state separately the items of value; and that the heating rates fixed were unjust and excessive.

The Supreme Court of Missouri reversed the lower court's judgment and directed judgment for the Commission and the company, State v. Public Service Commission, 249 S. W., 955, for the following reasons: The Commission's finding as to the value of the property was held not void for failure to itemize or state separately the "going concern" or "intangible value" of the plant, no evidence having been introduced to show such value apart from the physical value of the plant.

The fact that the company's steam heating business had been conducted at a loss for three successive years because of the great increase in the cost of fuel, labor and material during these years did not make the allowance of going value unlawful, there being no evidence that the business when on a normal basis had not been a feasible or practical one, and no showing that the demand for steam heat had in any way decreased.

The evidence did not show that the commission had failed to consider depreciation and make a proper allowance therefor in fixing the value of the heating plant.

The allocation and apportionment of the valuation and operating expenses of the joint plant on the basis of 85% to steam heat and 15% to electricity were held proper, the evidence showing that the primary use of the plant was for the furnishing of steam heat, and that to use it for producing electricity only would make the expense of the electric current prohibitive and the operation of the plant unprofitable.

The court referred to a number of commission cases apparently in conflict with this decision, but it regarded these as affording no rule or guide for it in this case, being widely variant in their facts. It agreed with the ruling in Decatur Ry. & Light Co., P. U. R., 1920 B 705, that, in determining the proper apportionment of expense of steam heat production in a combined plant serving electric and heat consumers, no hard and fast rule can be adopted, but each case turns upon its own circumstances.

The court held that the evidence did not show that the rates established by the commission were unreasonable or exhorbitant, the return to the company being less than 3% on its investment.

The company had about 250 consumers, the majority of whom also had their own furnaces and boilers, and could heat their own buildings by simply starting their fires, if they preferred to do so, rather than pay the rate fixed by the commission. In these circumstances the reasonableness of the rates fixed could be most accurately and satisfactorily tested by permitting them to remain in force for a reasonable time, to see whether the consumers would pay such rates or revert to the use of their own plants. The case was exceptional, in that the rates were subject to efficient competition in the hands of the consumers themselves. In effect, the rates fixed were test rates, subject to modification on motion of the commission or any of the parties after they had been in operation and tested by actual experience.

Subcontractor Cannot Enforce Lien Under Kansas Statute for Heating Plant Substantially Different from That Required by Contract with Owner

In an action under the Kansas Mechanics' Lien statute to enforce a lien for the installation of a heating plant, the question presented was whether, under this statute, a subcontractor may enforce a mechanic's lien for the installation of a heating plant materially different from the one specified in the contract between the owner and contractor where the plant was not sufficient for the purpose intended, was removed by the owner, and repossessed by the subcontractor. From a judgment for the plaintiff the owner appealed. The Kansas Supreme Court, Eggleston v. White, 214 Pac., 623, reversed the judgment and directed judgment for the defendant, for the following reasons:

The basis of a mechanic's lien under the Kansas statute is the contract with the owner of the property, and, while a subcontractor is not bound by all the terms of the contract with the owner, he must take notice of and is bound by such of the specifications of the contract as relate to and describe the particular materials which he undertakes to furnish. And where a contractor and subcontractor have entered into an agreement under the terms of which the subcontractor installed a heating system substantially different from the requirements of the contract with the owner, and insufficient for the purpose intended, it was held that the subcontractor was not entitled to foreclose a mechanic's lien against the owner's land.

The court said, in part: "It would be inequitable to permit the contractor and a subcontractor with whom he might deal to disregard the contract with the owner and install an inadequate heating system not satisfactory and not contemplated by the owner."

Correspondence

A Warm-Air Furnace Heating Problem.

I built a seven-room house last summer, installing a large-sized warm-air heater. We were unable to get any results whatever until the writer installed a cold-air return, but even now we are unable to heat the house satisfactorily.

It is my opinion that in installing this furnace, the contractor put in such small registers as to make the capacity of the furnace and the size of pipes of very little effect.

The attached memorandum lists the sizes of rooms, the pipe areas and outlets of registers. You will note that the outlets are just slightly more than half the area of the pipes. Although the above condition does not appear to me to be correct, it is possible that the draft has something to do with the inefficiency of the entire system.

Room	Pipe Diameter, In.	Pipe Area Sq. In.	Outlet Area, Sq. In.	Room Dimensions, Sq. ft.	
Kitchen	9	63.81	63.81	12 x 12,	156
Bath-room	8	50.26	30	5½ x 9,	49½
Living Room	9	63.81	36	20 x 13,	236
Bedroom	9	63.81	36	12 x 13,	156
Large bedroom	9	63.81	30	13 x 15,	195
Small bedroom,	9	63.81	30	12 x 13,	156
Sun Room	10	78.54	36	10 x 13,	130
Dining Room	10	78.54	36	12 x 15,	180
		398.77	231.81		
Hall				13 x 3,	39
Stair				13 x 3,	39
					1336½

Ceiling height, 8½ ft.
Total contests, 11,356 cu. ft.

We have an outside chimney, the tip of which projects about 2 ft. above the ridge of the roof, but the smoke pipe is quite long. I have noticed that when burning wood, the fire just smolders until the fuel door is opened when it bursts into a bright flame. There is also quite a tendency for the flames to come out the front door which would indicate to me that the draft is not correct.

The apparent troubles may be tabulated as:

1. Poor chimney draft. Caused by:
   (a) Long smoke pipe.
   (b) Cold outside chimney.
   (c) Chimney probably too short.
2. Warm air circulation poor. Caused by:
   (a) Defective return circulation.
   (b) Registers too small.
   (c) Leaders probably too long with insufficient rise.

A long smoke pipe (which necessarily approaches the horizontal) tends to reduce the draft. This is a very common defect when outside chimneys are used. Further it is unwise to connect a furnace smoke pipe with an outside chimney, unless said chimney is double walled, with an air space between. A single-wall chimney is always cold and retards the draft, especially when the cold wind is toward that side of the house. An inside chimney gives practically uniform draft, no matter how the wind blows.

Our correspondent does not state if this is a two-story house or a bungalow. We take it from the tabulations that it is a bungalow. If this is true, the height of the chimney is also to be questioned, because most bungalow chimneys are rather low. This may be a third item tending to reduce the furnace draft.

No facts are given concerning windows or doors in these rooms and there is nothing to help one to determine as to whether or not the leaders are large enough. If they are, then the fact still remains that the system is very improperly installed. Every warm-air heating system should have one or more fairly direct and amply large return lines to the furnace. It is better, if expense is not considered, to have returns from every important room in the house. In all probability, the return which our correspondent did put in is too restricted or improperly placed. This would tend toward reduced circulation.

All registers should have a net area equal to or greater than the cross sectional area of the pipe leading to it. This is a vital point. Again, if this is a bungalow, it probably covers considerable area and unless the basement is of considerable depth, the furnace may be so high that the leaders to the farther rooms are approximately horizontal, all of which would tend to reduce circulation.

Nothing is said of warm air stacks in this case. If there are any stacks, it is very probable that these are so small that they restrict circulation even more than the returns or the leaders.

In order to answer more definitely in this problem, it would be necessary to have the layout of the floor plans, showing where the furnace is set, the size and direction and rise of the leaders and returns. J. D. H.

Comments of a Canadian on Present-Day House-Heating Methods

EDITOR HEATING AND VENTILATING MAGAZINE:

It is rather remarkable that with the great advance made in the manufacture of fuel consumers of every kind in motion machinery, so little progress has been made in the science of house heating and ventilation, though the price of coal has increased three times. Steam, hot water and hot air have until now been used in connection with anthracite, soft coal and coke. Speaking generally, the situation as regards efficient heating remains in the hands of the ordinary householder, who is naturally profoundly ignorant of the principles which underlie combustion. The same lack of efficiency is seen in the application of principles, not only to the production of heat, but to its distribution and conservation when produced.

The writer, who, as a Provincial Health Officer for many years, has had his attention drawn to many engineering problems, wrote nearly thiry years ago a pamphlet on "House Atmospheres or Artificial Climates," in which were illustrated some of the serious effects on health due to bad heating, lack of ventilation and excessive dryness of the air of houses in northern climates in America. In the following remarks he wishes to indicate some of the most important factors which enter into this problem, and methods for insuring efficiency.

1. Where it is everywhere and at all times available, there is no question but that electric heating is the most convenient, clean and satisfactory, and that where it sells at ½c. to 1c. a kilowatt-hour, as in several centers in Ontario by "Hydro" supplied by the Government, it is cheaper than anthracite at present. But as this is not as yet generally available, we shall turn our attention to other sources of heat.

2. Undoubtedly American anthracite for the ordinary water heating and warm-air household furnace easily takes the first place among coals of every kind as regards its heat units, its steady glow and its cleanliness; but unfortunately the supreme control of the supply, with the visitation of annual disputes between operators and Labor, in which the public is not only inconvenienced, but kept "cold with fear" of a lack in the supply each winter, with its constant increase in prices, is making the people sick for other means of a fuel supply.

3. Perhaps at the present moment the most natural direction in which the people are turning is to the use of oil as a fuel, in view of its greater number of heat units, its cleanliness and lessened cost of labor. Could it be utilized, like producer-gas and coke, for central heating, it is certain that with its relatively high number of heat units per pound (20,000 B. T. U., as compared with 12,000 B. T. U. for anthracite), it would prove to be a most satisfactory fuel, as is seen in its use in steamships and locomotives. But even though such central heating is not yet generlly possible, the use of oil as a household fuel has come into practical use, and with the improvements in the automatic regulation of the supply of oil, and at present prices, and with more complete combustion, it is going to play an important part in the solution of the fuel problem.

4. In the successful use of every kind of fuel it is necessary for the householder to know what is aimed at. For instance, bituminous coal has some 35% of volatile carbon, which in ordinary furnaces has its units as fuel almost wholly lost up the chimney, the loss of heat units in locomotives being over 90% of the total. Much better results can be obtained in sta-

tionary, underfeed, automatically-stoked furnaces, where the gases pass over an incandescent flame supplied with air by a blower.

5. It is apparent, then, that it is the intimate mingling of the oxygen of the air with the heated particles of coal, gas or oil, which insures the highest degree of combustion and heating economy. The ideal is the blue flame of complete combustion seen in the ordinary gas range, where the air and gas are intimately mixed before reaching the burner. This is largely obtained by first heating the crude oil carried under the boilers on ships and then driving it under pressure through a minute opening where it meets with the current of the fresh air, and is atomized, insuring very complete combustion.

6. A similar attempt has been made with increasing success in the household furnace, where a small electric motor is used to drive the air into the furnace where it meets with a small stream of oil from which the gasoline and lighter oils have been driven. This oil flows from a gravity tank or is supplied by a pump. In this case it is found, as on shipboard, that preheating the oil to a point lower than where it "cracks," or where the carbon and hydrogen of the oil dissociates and carbon tends to collect in the supply tube, aids greatly in the atomizing of the oil and the intimate mixing of the air, which insures complete combustion. Various means are adopted to insure this, but in every case the fan supplies the air with its oxygen for combustion.

7. In every case, however, when the fan is used, a loss is liable to occur from the forced draft, driving the heated gases of combustion through the sections of the furnace before the heat can be absorbed by the water or air sections, to the extent of a loss of at least 25% of the heat. In warm-air furnaces, drums around the smoke-pipe and a long length of pipe leading through rooms have been used to lessen the loss; but they have been only partly successful and success is only obtained when the gases of the first furnace are carried through a second, or some such means are adapted as a "Manny" heater, which consists of a number of small tubes, with a water jacket around them, through which the hot gases go to the chimney.

8. Having dealt with the heating problems, the most important matter is the air distribution throughout the house. Undoubtedly hot-water coils insure the conduction of heat to each room, where the hot pipes radiate their heat, and in which a good circulation will insure the passing of water at 180° F. through the coil, losing the most heat per minute at this high temperature, but returning to the boiler with little loss, and so requiring the least heat to maintain the temperature. If the furnace be a warm-air one, then the shortest directly-ascending number of pipes to floor registers in near rooms is both economical and certain of best results, if in installing the system a number of small exhaust pipes on the outer walls of north, east and west rooms have been installed, leading back to the draft in the ashpit of the furnace.

9. Another point of much importance is the supplying of a moderate amount of fresh outer air directly to the hot-air jacket of the furnace, to insure not only fresh air in the house, but also to create a plenum or fullness of pressure from within outward, which is accomplished with certainty when the far-off rooms are partially emptied by the return pipes to the ashpit. So drafts from around windows and under doors are prevented and a notable saving of fuel insured.

10. In all cases successful and economical winter heating demands that the loss from high-conducting panes of glass windows be overcome or lessened by closely-fitting double windows, and a deep air space between them, since of all substances, air is the best non-conductor. Of course hollow walls and air spaces between the lath and wall, as well as tar paper and other non-conducting materials, such as hollow bricks, greatly increase the heating efficiency by preventing loss through conduction and radiation of heat from the walls.

11. Being assured that these matters have been attended to, the question of moisture in house air in winter is of supreme importance. To understand this it is only necessary to know that outside air at zero can only hold ½ grain of water per cubic foot, but that when this air enters the house and is heated to 70° F., it can hold 8 grains of water, or sixteen times as much. Hence, since house air ought to have 50% to 55% of moisture in it, it is apparent that about 4 grains of water must be evaporated to supply enough moisture for every cubic foot of air space in a house, if the air changes once every hour.

In other words, if the cubic feet of air space in a house is 25,000 cu. ft., such as an ordinary house about 30 ft. x 25 ft. x 35 ft., it needs to receive from 1 gal. to 1½ gal. of water in the shape of vapor every hour. To those who have seen the little 2-gal. pot in the ashpit of the ordinary warm-air furnace, this may seem absurd, yet such is demanded. Fortunately apparatus is now obtainable where the required supply of moisture can be assured at a very moderate cost by attaching the appliance either to a water heating boiler or warm-air furnace or to an electric heater.

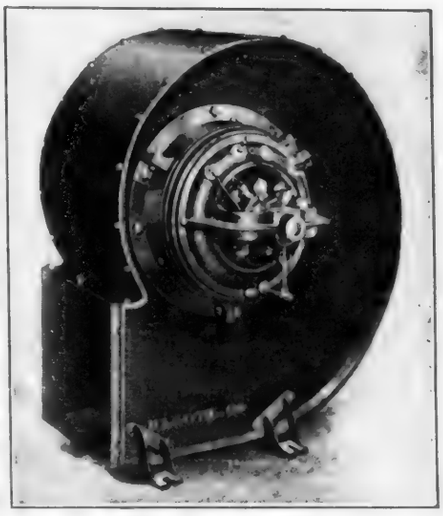
PETER H. BRYCE.

Ottawa, Ont., November, 1923.

Development of the Reversible Fan Housing.

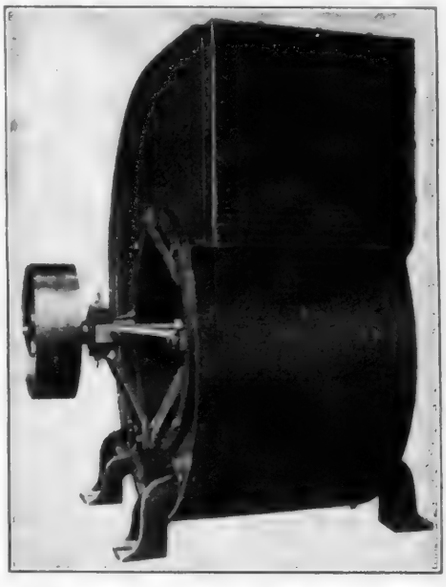
The description in the October issue of the development of a reversible fan housing whereby the same fan may be adapted for a right-hand or left-hand discharge or from a top vertical to a bottom horizontal discharge, brings out the fact that a similar type of housing in both direct-connected and belted blowers, is characteristic of the fans of the Ilg Electric Ventilating Company, of Chicago. This construction, the company states, has been followed for 15 years and, in fact, its fans have always been built that way.

The accompanying illustration, showing the interchangeability as to discharge and drive, appeared originally in a circular published by the Ilg company in December, 1910. The circular goes on to state that "the holes in both castings are equally spaced, drilled to template, making it possible to change any blower from right to left hand drive, or vice versa. This construction also permits the discharge to be swung to any angle."



Ilg Bottom Horizontal Discharge Blower with Reversible Fan Housing Feature

In the 1915 catalogue of the Ilg Electric Ventilating Company is shown a belted blower which has all the interchangeable features of its direct-connected blower, together with the further feature of being interchangeable from direct-connected to belt-connected, and vice versa.



Ilg Universal Belted Blower with Interchangeable Feature to Bracket and Motor

Other steps which have been taken by the Ilg company in connection with fan development are the use of lightweight central suspension blower wheels and heavy cast-iron housing, which is described as an entirely different principle from that in common use at the time; also the use of high tip speeds on direct-connected blowers.

Offer of American Manufacturing Rights to Ozonair.

Sole manufacturing rights in America of Ozonair apparatus are now available, according to an announcement just made by the manufacturers, Ozonair, Ltd., London. The company's product comprises a full-line of ozone apparatus, including stationary, transportable, semi-portable and portable machines. This line has been on the market since 1906 when the company was organized by Edward L. Joseph, the present director and general manager. Probably the company's most notable installation is that in the London tube, in connection with the tube's ventilating system. The entire system was designed and constructed by Ozonair, Ltd., in conjunction with E. P. Grove, at that time engineer of the Central London Railway. It has been in successful operation since 1911.

In addition to their use for the purification of air, the company's products have been applied to a variety of processes, including water purification, deodorizing, bleaching, brewing, oxidation and ageing. For the purification of air the company has developed the Ozonair system of ventilation, a typical arrangement of which is shown in Fig. 1. Briefly, the system consists in drawing the air supply from as pure and clean a source as possible, and removing the smuts and other solid floating matter by means of one of the special air washers or filtering screens manufactured by the company. Incidentally, it is stated, the washer or screen can be arranged, under certain conditions, to cool the air up to about 10° F. difference between the outdoor and indoor temperature. The cleaned air is then passed into the mixing chamber where it is purified and partially sterilized by the addition of a minute quantity of pure ozone.

The purified air is forced by the fan into the building through ducts which are provided with openings at suitable points. In most cases the company has found it unnecessary to provide any special exhaust system. An exception to this is in the case of theatres and there the company's practice is to construct a false ceiling over the auditorium, with one or more ornamental gratings and an exhaust fan in the roof. Where this arrangement is not practicable, outlets are provided and connected together with suitable duct work.

The company's filter screen, already referred to and designed for use in smaller installations, is made of finely-woven metal gauze, mounted on a framework of angle iron and wrought-iron tubing. It is usually in the form of a zig-zag when looked at in plan. The gauze is kept covered with a very thin film of water by means of a special atomizing appliance made by the company. For the larger installations an air washer of the standard type is included with spray nozzles, eliminator baffles, etc.

The arrangements of the heating surface follows the usual procedure, including indirect heating surface and the use of electrically-driven Sirocco fans.

The ozonizer generally used with this system is made up of units, each consisting of two specially-designed electrodes, separated by a dielectric and held in position by insulating clamps of non-conducting material. The ozonizer consists essentially of metal and porcelain and is entirely non-combustible. Owing to its design, it can be made in any size or capacity. Each individual unit is connected by two electrodes to a separate terminal on small bus-bars running along the whole length, so that the whole or any number of units may be in use at one time. The wire guards of meshed wire are provided to protect the apparatus from injury or interference.

Fig. 2—Self-Contained Ozonizer for Large Installations.

This type of ozonizer is generally enclosed in a metal case. The door in front is fitted with an arrangement to cut off automatically the electric supply when it is open. At the bottom is a removable frame in which an air filter of absorbent cotton wool is fitted. A shelf is provided at the side for the transformer. The inlet to this case, under the cotton wool screen, communication with the source of fresh air, while the outlet at the top of the case communicates with the intake of the fan. In this way the ozonizer forms a by-pass to the main supply of fresh air.

For the larger installations, or where the supply of ozone exceeds the usual average, the company has designed a new type of apparatus, illustrated in Fig. 2. In this type the ozonizer and case are self-contained and form a unit which can be placed on the floor of the plant room. The transformer is "housed" in the base of the case which is fitted with hinged inspection doors, back and front.

Ozonair transformers are made in several sizes varying in capacity from 100 watts upward. As arranged, the transformers give a variation of the secondary voltage, the primary being wound in several steps, having a range of about a quarter to the maximum required voltage. By this means the amount of ozone can be adjusted to any required strength, the regulation being effected by a multiple switch mounted on the switchboard.

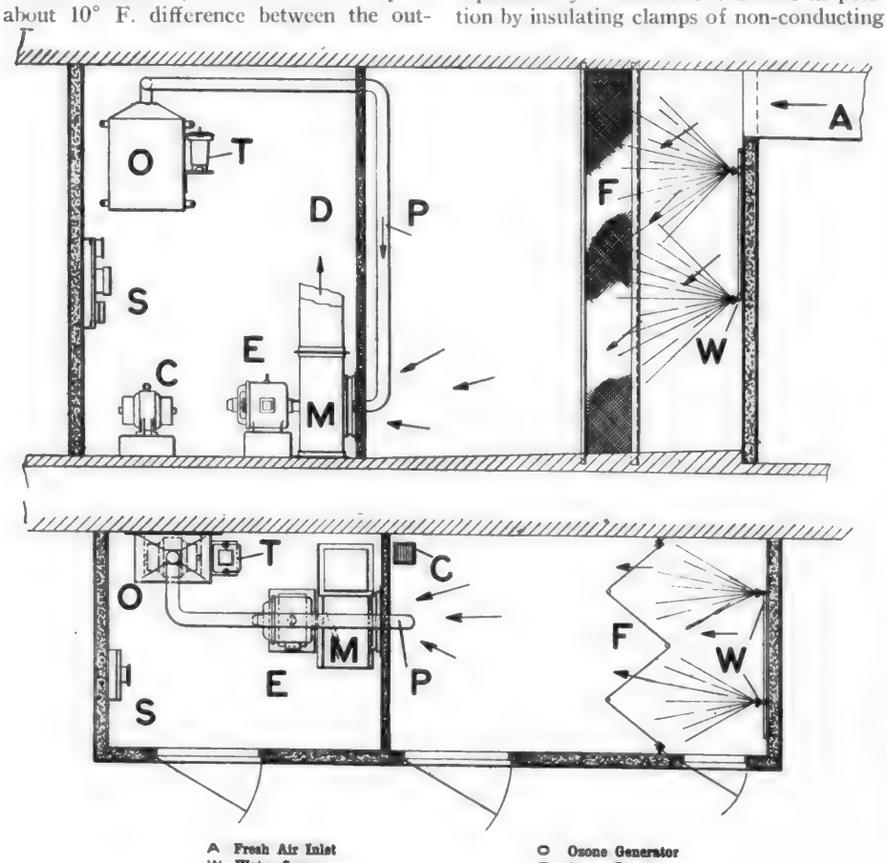


Fig. 1—Typical Arrangement of Ozonair System of Ventilation.

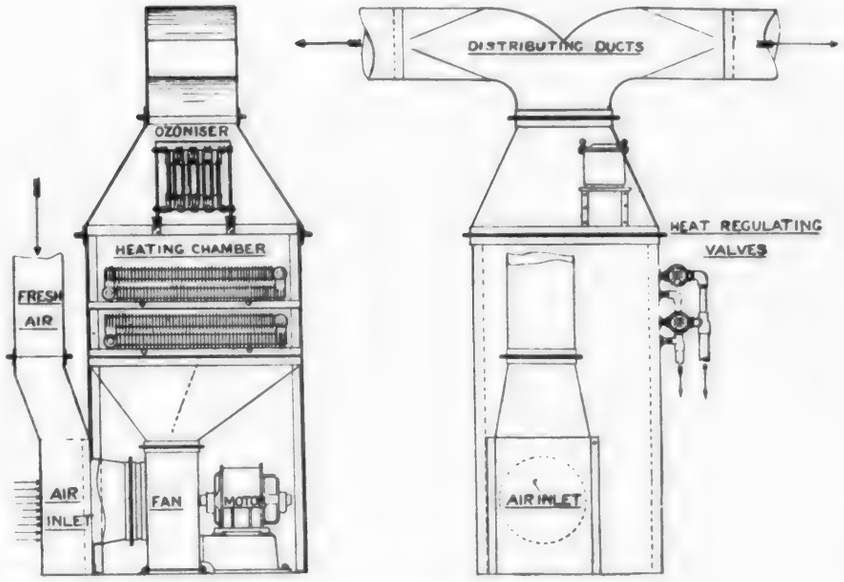


Fig. 3—Unit Heater with Ozonizer Equipment.

As the production of ozone requires alternating current, the company provides a rotary converter for use where direct current only is available. A suitable switchboard completes the system.

For recirculating work the company provides a unit made up of a metal casing in which is contained a heating element over which the air is recirculated by means of a fan, the air entering at the base and passing out from the top (Fig. 3). These units can be made with a fresh-air connection so that a certain proportion of fresh air may be admitted, if desired. The whole unit is self-contained, and as it requires no special foundation, it can be placed on almost any kind of floor. These units are made of capacities to deal with 3000 to 4000 sq. ft. of floor space, but special sizes are also available.

The offices, showrooms and laboratories of Ozonair, Ltd., are located at 96 Victoria Street, London, S. W. 1.

American Society of Heating and Ventilating Engineers

New Officers for Illinois Chapter.

Officers of the Illinois Chapter, elected at its opening meeting of the season, are: President, Charles D. Allan; vice-president, Homer R. Linn; treasurer, August Kehm; secretary, H. G. Thomas. Board of Governors: J. A. Cutler, A. B. Martin and E. P. Heckel.

A report on the expenses incurred in connection with last summer's meeting of the American Society of Heating and Ventilating Engineers in Chicago showed the voluntary subscriptions to have been so large that a refund of 17% was made to the contributors.

Following the routine business S. H. Viall, combustion engineer for the Chicago, Wilmington & Franklin Coal Company, gave a lecture on the "Origin and Production of Coal," which was illustrated by motion pictures. The meeting was held at the Engineers' Club, Chicago.

New York Chapter Holds "Good Fellowship" Meeting

Any doubt as to whether good fellowship prevails at the meetings of the New York Chapter was dispelled at its opening meeting, in the Building Trades Club, October 15, when the evening was devoted to the subject of "The Value of Acquaintanceship." Fred R. Low, editor of *Power* and president-elect of the American Society of Mechanical Engineers, was the guest of honor and his talk on the subject was a pithy analysis of the way many of us act and feel and of the way we can spread the gospel of good fellowship at our meetings.

After the routine business had been taken care of President W. L. Durand turned the meeting over to Alphonse A. Adler. Following Mr. Low's address, Mr. Adler called on Homer A. Addams, nominee for president of the American Society of Heating and Ventilating Engineers, who endorsed the sentiments of the previous speaker. A number of the chapter members were also brought to their feet by the versatile chairman and contributed to the discussion. The appointment of a special "Glad Hand" committee was announced, consisting of George G. Schmidt, chairman; and H. A. Hanson, R. H. Carpenter, Alfred Offner and Anton Pieron. A resolution of sympathy to Frank K. Chew in connection with his illness and wishing a speedy recovery was adopted by the meeting.

Western New York Chapter

Meeting in the chapter's new club room in the Hotel Statler, Buffalo, which it has acquired through its affiliation with the Engineering Society of Buffalo, the Western New York Chapter started its fall season October 8, when some 50 members and guests were present. President Farrar opened the meeting and presented C. V. Haynes as the first speaker. Mr. Haynes described the recent work done by the A. S. H. & V. E. Research Bureau in determining the carrying capacities of return pipes of steam heating systems. Mr. Haynes, in response to requests, also told of his trip abroad last summer. Other speakers were William A. Russell, one of the founders of the American Society of Heating and Ventilating Engineers, who spoke interestingly about the origin of the society; and Frederick W. Zander, whose talk on "Friendliness" made a hit. The meeting was in charge of Hugo Hutzel, chairman of the speakers' committee.

St. Louis Chapter Adopts a Slogan

A slogan contest enlivened the dinner preceding the first meeting for the season of the St. Louis Chapter, held at the Hotel Melbourne, September 20. There was a number of four figures sealed in an envelope, and each member and guest was given an envelope with a card enclosed, each bearing a serial number. The members wrote a number and suggested a slogan or motto for the chapter. The four nearest numbers to the sealed number entitled the lucky guesser to a dinner ticket, and the slogan selected as best by those present also entitled the winner to a ticket. Messrs. Sodemann, Graves, Bayes and Toenseldt were the lucky guessers, and the prize for the slogan selected, "Ventilation for Health, Heat for Comfort," was awarded to Secretary Thomas Gale.

The subject for the evening, "Community Heating" was presented by George B. Nichols, of New York, accompanied by stereopticon views illustrating present-day practice in underground conduit work.

The Journal to be Published Monthly.

Announcement is made by the American Society of Heating and Ventilating Engineers that, commencing with the new year, the *Journal* will appear every month. Heretofore there have been nine issues during the year, those of February, June and August being omitted.

Foreign Commerce Handbook

The 1923-1924 Foreign Commerce Handbook of the Chamber of Commerce of the United States, recently issued contains much valuable information for manufacturers interested in import and export trade. It is particularly informative as to the best available sources of information on foreign commerce in the United States and lists many of the publications which have been issued by the U. S. Bureau of Foreign and Domestic Commerce and by corporations, banking houses and associations. In addition, attention is called to the program of work undertaken by the Foreign Commerce Department Advisory Committee of the Chamber of Commerce of the United States and the service the department renders.

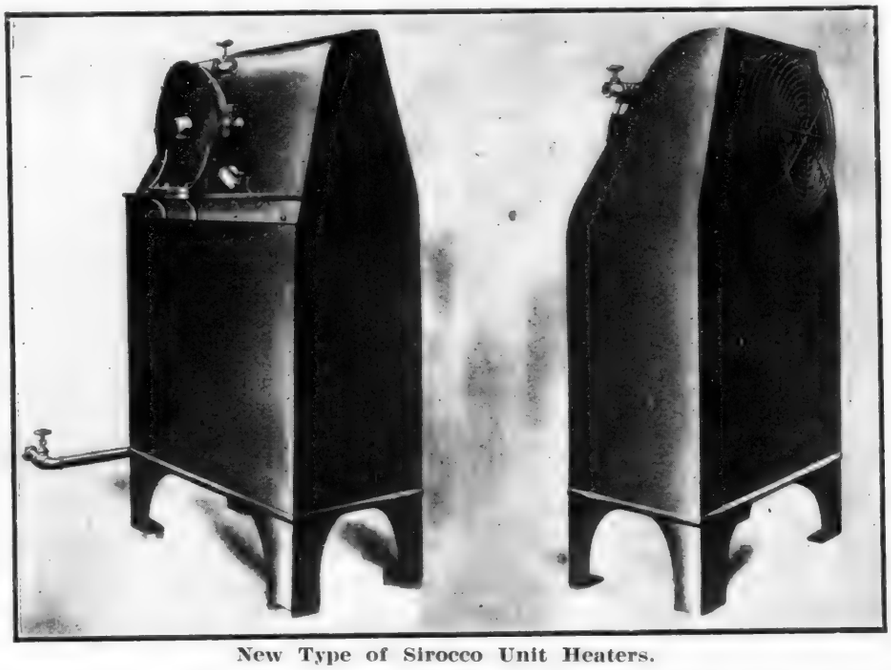
Portable Unit Fan Blast Heaters

Previous articles in this series are: 1—The Baetz Heater, July, 1922; 2—The Ilgair Unit Heater, August, 1922; 3—Wing-Scruplex Unit Heaters, August, 1922; 4—The Bayley Thermo-Units, September, 1922; 5—ABC Portable Heating Units, September, 1922; 6—Sturtevant Unit Heaters, October, 1922; 7—Twinvent Unit System, January 1923; 8—York Welded-Coil Unit Heater, February, 1923; 9—The Gordon Unit Heater.

No. 10—Sirocco Unit System of Heating

An English unit system which well deserves a place among those already described in this series is that developed by Davidson & Co., Ltd., of Belfast, Ireland, and marketed under the name of Sirocco. Care is taken by the company to point out that it does not operate in the United States, but that Sirocco apparatus is manufactured by the American Blower Company, of Detroit, Mich.

In a description of this product the manufacturers state that the unit system of heating factories and workshops has come greatly into favor in England during recent years, on account of the flexibility of the system and the ease with which the units can be installed. It has proved particularly suitable for buildings having a large cubic contents in proportion to the number of occupants, and in which recirculation of the air does not affect the purity of the atmosphere to any great extent.



New Type of Sirocco Unit Heaters.

The Sirocco system involves the installation of a number of independent units, each comprising a heating element consisting of cast-iron gilled radiators, encased in a sheet-steel casing, at the top of which is mounted a propeller fan which blows the air downward through the heater and distributes it near the floor level. The units use steam as a heating medium, occupy but little floor space and can be placed at points where the heat is required. No air ducts are used with this system. The temperature can be regulated at each unit. Extensions are easily carried out and the units can be readily removed and installed in new positions when required. They are featured also as being especially useful for supplementing an existing heating plant of insufficient capacity.

Hitherto the usual practice has been to operate the propeller fan on the unit by an electric motor, or to drive it by means of belting from shafting. This involved in the one case the necessity of running electric cables to each unit, or, in the other case, having to place the unit in a congested area in proximity to the existing shafting. A new unit, however, has just been placed on the market by Messrs. Davidson & Co., Ltd., in which the fan is operated by a small steam turbine. The steam required for heating purposes in the battery is first admitted to the turbine when, having performed its work of driving the fan, it passes out as exhaust steam into the heating battery, and is the only steam from which the heat is derived. Consequently this unit not only does away with the necessity of electric wiring or the use of belting, but provides fan-driving power gratis, so to speak, as no electric current is required, nor is any power taken from the shafting.

The turbine, which is described as of rugged construction, is of the impulse velocity type, and is designed to operate with any specific pressure between the limits of 105 lbs. and 15 lbs. pressure per square inch. The turbine spindle, on which the propeller wheel is mounted, is carried in two ball bearings and enclosed in a dust-proof housing, rigidly secured to the turbine casing. The bearing next to the turbine is protected from steam and water by a labyrinth gland.

No reducing valve, it is also pointed out, is required with this unit, as the turbine acts in that capacity. Also, on account of complete condensation taking place in the heating batteries, the use of steam traps is obviated.

These units are designed to raise large volumes of air through a moderate temperature range. According to the manufacturers' rating tables, each unit will give an output of approximately 180,000 B.T.U. per hour with the fan operating at about 1000 R.P.M.

The company also makes an interesting type of steam heater unit for use with high-pressure steam. In this unit the heating element consists of a battery of weldless steel tubes bent to an inverted U-shape and expanded into a cast-iron base. The battery is surrounded by a circular sheet-steel casing on the top of which the propeller fan is placed. The fan blows the air down through the battery, as in the low-pressure unit. The high-pressure unit can either be placed on the floor, or, if desired, bolted to a column of a building.

HEATING DATA BOOK is the title of a new manual, of pocket size, published by the Hoffman Specialty Co., Waterbury, Conn., and containing, among other things, tables of pipe sizes, instructions for figuring radiation, and diagrams of model heating installations. The manual, it is stated, is not a theoretical treatise, but a practical handbook for every-day use. The company, it is stated, has spent thousands of dollars and months of work in the preparation of this Data Book which is being sent out gratis to established members of the heating industry. Those desiring to procure copies are asked to use their own letter-heads, stating specifically to whom the books are to be sent.

Ventilating Garage Pits.

For the purpose of ventilating the pits in a California garage small portable electric fans are provided. They are set about 18 in. above the floor of the pit, as shown in the accompanying illustration. Electric current is obtained by plugging in at the end of the pit, shown by the arrow at the right.

Scheme for Ventilating Garage Pits.

National Trade Extension Bureau

Heat Regulation Publicity Suggestions

Some good ideas for bringing home to the public the value of temperature control devices are supplied by the National Trade Extension Bureau in a series of advertisements which have been prepared for co-operative use by association or groups of heating contractors. Each advertisement is intended to have a definite sales-building appeal, besides increasing the goodwill of the public toward the heating industry.

Evolution of Househeating
From every Indian tepee smoke rose from a fire in the center of the floor
Pioneer white men built huge open fire-places, from which most of the heat went up the chimney, and keeping warm meant much cutting and carrying of wood. The wood-burning stove was hailed as a stroke of genius because it radiated so much more heat into the room. Then came the coal stove with even greater heating efficiency
But all of these suffered the same draw-back—the FIRE HEATED ONLY ONE ROOM
Then came the warm air furnace, sending warmth from a single fire to a number of rooms. Even more recently came the method of circulating steam, hot water or vapor to a radiator in every room.
Finally, automatic regulation of fire control—far more flexible and reliable than human attention can ever be—is now perfected. Continually on watch and immediately responding to the slightest change in temperature, it prevents—alike—either overheating or chilling; thereby avoiding waste of fuel and protecting health and saving work. Modern heat by radiators, automatically regulated, is the acme of house-heating economy and comfort. Ask some member of this association for more particulars
ASSOCIATION NAME
GUARANTEE
Heedless Extravagance
With coal at today's prices, "heedless extravagance" just about describes the process of regulating fires in boilers and furnaces by hand.
Four, practical tests—and the experience of thousands of householders—have proved that automatic heat regulation is profitably economical of fuel, as compared with hand regulation of dampers and drafts. Moreover it protects health and comfort by preventing—equally—overheating or chilling of rooms
Automatic heat regulation can be installed on any heating plant and assures evenly regular temperatures throughout the house—at all hours. It ends hurried trips to the basement to stop excessive heat; ends the annoyance of waiting for cold rooms to get warm. In all weathers, with a minimum of firing attention, it reliably insures healthy comfortable heating. Under clock control, it will cool the house during sleeping hours and warm it up again at rising time
Heating plants last longer with automatic heat regulation—replacements of grates and fire box are fewer. Actually a heat regulator pays for itself in a few seasons; all the while with a valuable by-product of comfort and convenience. Ask some member of this association for a demonstration. Have it installed now, for economy and comfort's sake this winter
ASSOCIATION NAME
GUARANTEE
CASHIER
SAVE three shovelsful of COAL a day
If you deliberately threw away a couple or three shovelsful of coal every day—at the end of winter you'd have wasted a lot of valuable fuel—unburned. BUT PAID FOR!
And with ordinary methods of regulating a heating plant at least that much fuel is wasted daily—throughout the heating season!
Attempting to control a fire by hand! operation of dampers and drafts causes the waste! Raising windows when a room is too warm, increases the waste. And besides the waste of fuel—the spurts of excessive heat and the sudden chilling of rooms is a common cause of colds and winter ailments. Finally, because perfect regulation of fires in any furnace or boiler is impossible with human hands, many extra trips to the basement are necessary—which fatigue and exasperate the householder.
Automatic heat regulation assures constant, positive control of dampers and drafts—maintains an even, healthful temperature at all hours, throughout the house. The fire burns evenly, supplies heat only as required, never too much or too little. You fire up less often, of course
An automatic heat regulator pays for itself in a few heating seasons, and then starts MAKING MONEY for its owner! Ask some member of this association for further details. Then you'll want the installation made before cold weather arrives.
IATION NAME
GUARANTEE

Suggestions for Temperature Control Publicity.

In this connection the bureau suggests a window display shown in the accompanying illustration. The directions for getting up this display, as given by the bureau, were reproduced in THE HEATING AND VENTILATING MAGAZINE for September.

Portable Fan Equipment for Furnace and Tunnel Cooling

A new field for fan development is suggested in the application of several portable fan units of the Buffalo Forge Company make, which have been installed in one of the subsidiary plants of the Bethlehem Steel Corporation, and at the Iowa State University, at Ames, Ia. These units, as their name implies, are made to be readily movable from one section of a building to another.

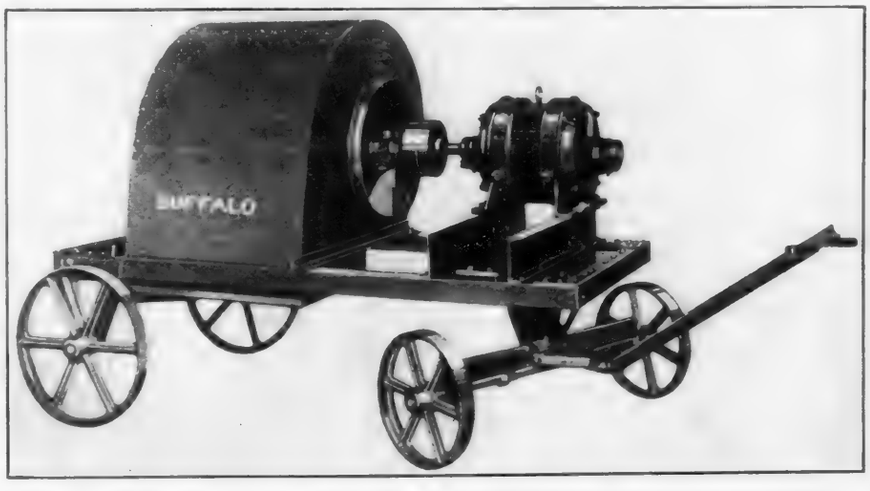
Both fans furnished with these portable units are of the No. 4 double Duplex Conoidal type. The first of these units, delivered to the Bethlehem Steel Corporation, is being used for furnace cooling purposes, the entire unit being conveyed from one stove to another as needed. The practicability of the portable unit is shown in this installation. In the average steel plant when a stove is put out of commission, it takes from ten to eleven days for the brick to cool down to a point where it can be handled. The purpose of the forced draft, of course, is to quicken the cooling process. The air handled by the blower is at a temperature of 70° F. and is blown through a checker work of approximately 350,000 bricks, these bricks having a very high temperature immediately after closing. Inasmuch as these furnaces are shut down very irregularly and at long intervals, it was not deemed a practicable solution to install a blower for each furnace. The one portable unit now installed takes care of the cooling requirements of all the furnaces.

The blower installed at this plant operates at a capacity of 15,000 cu. ft. per minute against 2½-in. static pressure. The R.P.M. is 1150. The swivel discharge nozzle is connected to a 20-in. diameter opening and fits both right and left-hand stoves. The unit is equipped with a flexible coupling and is direct-connected to a motor. The fan, including the motor, is mounted on a four-wheel truck some 6 ft. in length which has a handle attached for hauling purposes. This can be hauled easily from one part of the building to another by two men.

The other portable unit, supplied to Iowa State University, at Ames, Ia., is of the same size and type, but is being used in this instance for blowing fresh air into pipe tunnels through which the pipe lines for heating purposes are carried from the central heating plant to the various buildings. The fan is connected by means of a flexible air duct to a tunnel opening when repairs or installation of new equipment necessitates work being done inside.

A striking picture of the Pacific smokeless boiler for burning soft coal smokelessly occupies nearly half of the inside sheet of the folder, with the text beneath the illustration devoted to details of its construction and operation.

Pacific Steel Heating Boilers are featured in a folder just issued by the General Boilers Company, Waukegan, Ill.

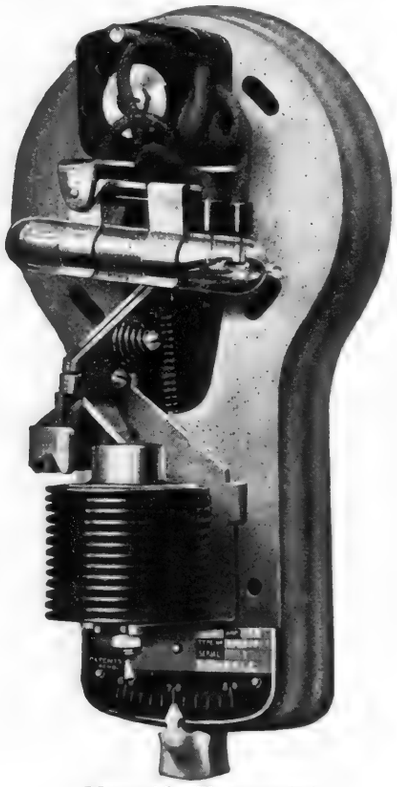


Portable Fan Equipment in Plant of Bethlehem Steel Corporation.

New Apparatus and Appliances

New Ideas Embodied in Thermostat Design

A novel type of thermostat for use wherever it is desired to make or break an electric circuit automatically in accordance with temperature changes and suitable for starting and stopping motors of 1 H.P. or less attached to fans, boilers, pumps, etc., or to light electric lights and ring alarm bells, has been developed by the engineers of the American Radiator Company and is being manufactured by its associate company, the Detroit Lubricator Co., Detroit, Mich. This device has been given the name of the Mercoid thermostat. Until the development of this instrument, it is stated, no practicable method has been found to obtain accurate and sensitive control in thermostats carrying more than a minimum amount of current at 110 or 220 volts. The heavy current would soon burn out the metal contact points, causing oxidization and failure of the instrument.



Mercoid Thermostat.

Through the use of the "Mercoid switch" it has been made possible to construct a thermostat which will automatically make or break the circuit without the use of expensive relays, transformers or other intermediate controls. The Mercoid thermostat connects directly to motors or other operating devices, throwing the motors or other devices directly across the line carrying the full current, without injury to the contacts.

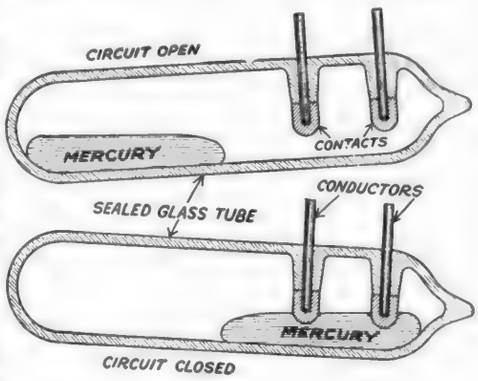
The Mercoid switch itself consists of a glass tube in which are sealed leads of suitable material. A quantity of mercury makes or breaks the circuit when the tube is tilted. Hermetically sealed within the tube are inert gases which stifle the arc instantly. There is no oxidation or corrosion, state the manufacturers, and the contact is permanently clean and instantaneous in operation. Due to the enclosed contacts the value of this instrument in locations where an open arc might increase the fire hazard, is apparent.

The thermostatic member consists of an all-metal bellows containing a volatile gas expanding with the advance in temperature. The power exerted by this element and the design of the tilting mechanism cause the mercoid to move with a quick snap action resulting in positive make and break of the circuit. Adjustment for temperature is arranged for by means of a compensating spring which covers a range of 25° F. Thermostats for controlling box temperatures in refrigeration work have an adjustable range of 40° F.

Mercoid thermostats are supplied with either single circuit or two circuit switches. The single circuit is for use where the current is to be merely thrown on or off, according to temperature, as in starting or stopping a motor, when used with oil-burning devices or in refrigeration work. The two-circuit switch is used where a three-wire line is employed to make contact on both the "hot" and "cold" side of the thermostat. By using two single-contact tubes, two pole connections are 1903.

available, as where three-phase current is used, or where it is desired to make and break two separate circuits.

For the regulation of brine temperature and similar work, Mercoid thermostats

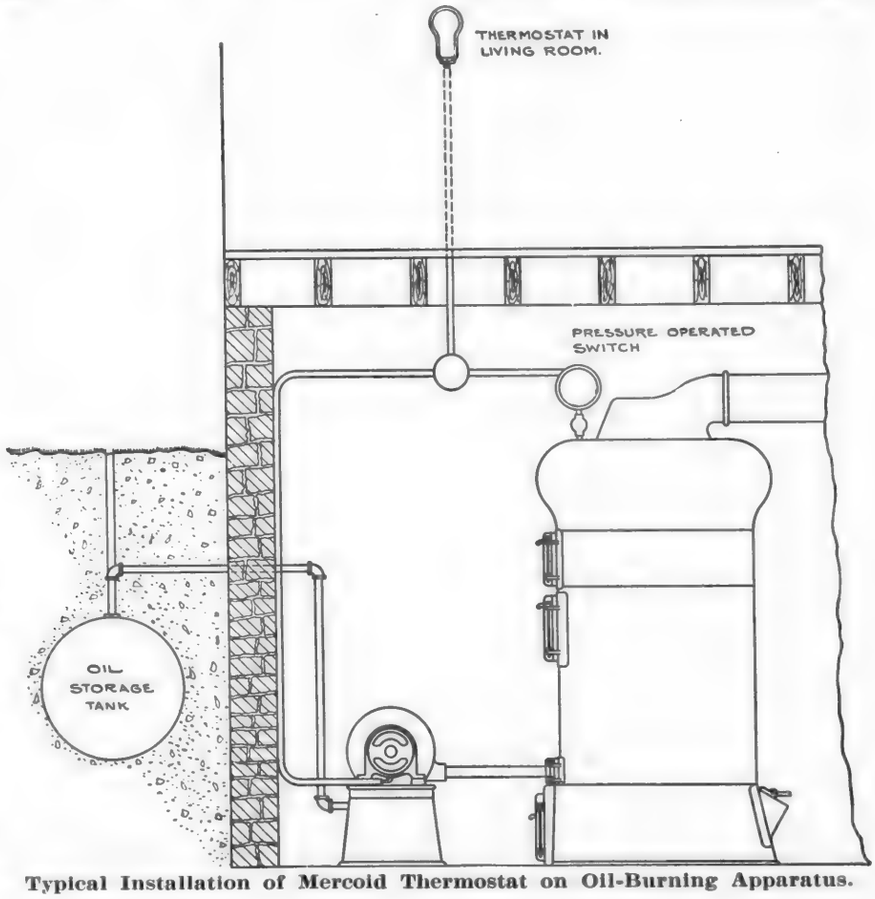


Sectional Sketch of Single Contact Mercoid.

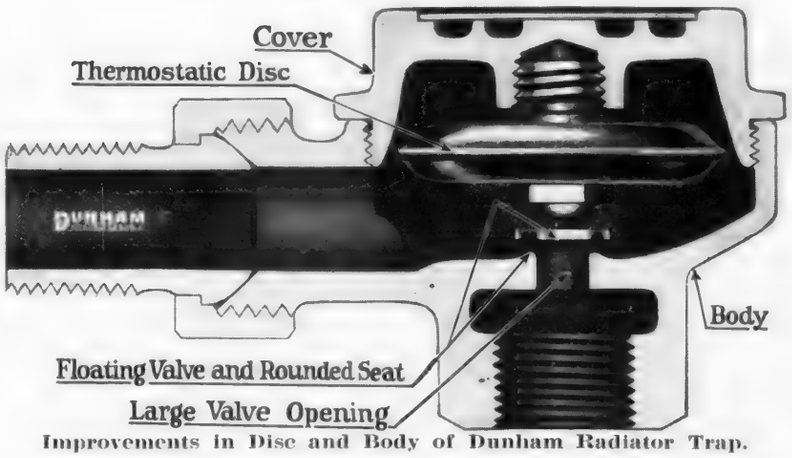
can be equipped with flexible tube and bulb connection to the bellows for control of liquids. The bulb can be furnished with threaded connection for insertion in tanks or pipe lines, if desired. This type of instrument can also be supplied to furnish close control of low pressures.

New Design of Dunham Radiator Trap

Improvements in both disc and body of the Dunham radiator trap are announced by the C. A. Dunham Co., Chicago, Ill. The manufacturer points out, however, that the Dunham principle remains unchanged as the improved trap of 1923 does not differ in any way in principle or method of operation from the first Dunham trap put into service in



Typical Installation of Mercoid Thermostat on Oil-Burning Apparatus.



Improvements in Disc and Body of Dunham Radiator Trap.

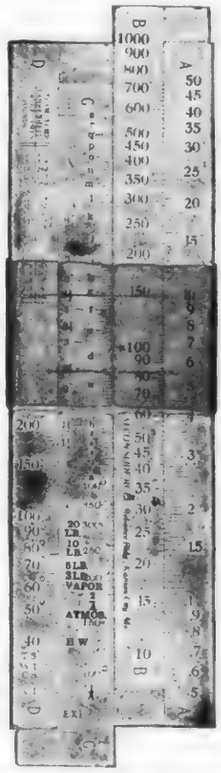
In the new disc construction increased life, it is stated, has been obtained through a change in curvature design, which strengthens the expansive qualities of the disc. Thickness of disc metal has also been increased. To allow a freer passage of condensation and foreign matter the new design provides for a greater lift of the disc. Finally, the change from a fixed to a floating valve on the disc has been made to assure the square seating of the valve.

New Construction of Dunham Radiator Trap.

In connection with the body improvements the rounded valve seat has been adopted to prevent deposit of foreign matter on the seating surface and to make more positive the tight, flat seating of the valve, even when dirt is present in normal quantities. The rounding of the seat has been found effective also in reducing capillarity.

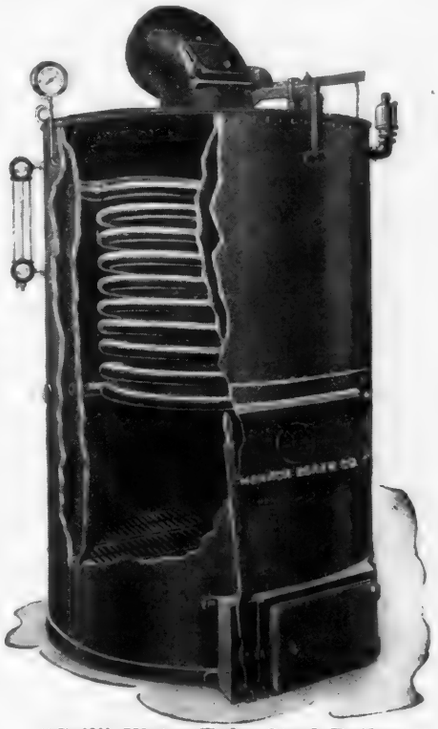
Another advantage gained in the new construction is that the enlarged diameter of the valve seat hole increases the operating capacity of the trap and permits larger pieces of scale and other foreign matter to pass. The new No. 1 trap is now sent out on all orders and installations.

ALCLIN SLIDE RULE, for computing radiation for water heating systems, atmospheric systems, direct steam, vapor or vacuum systems and high-pressure heating systems, is described in an envelope stuffer-size folder issued by General Heating Supply Co., Kansas City, Mo. The Alclin slide rule is based on B. T. U. heat loss factors and does away entirely, its makers state, with all need for a table of these factors. It consists of four scales, A, B, C, and D, two set stationary and two movable. It is about 5 in. in length and 1½ in. wide. Scale A (stationary) shows resulting amounts. Scale B (movable) contains amounts corresponding to known areas or lengths to be computed. Slide C (movable) contains heat loss symbols corresponding to the factors used for the various types of construction, also the scale of various temperatures and pressures for pipe expansion: graduations for the various heating systems at different pressures and graduations for computing heating surfaces of various sizes of pipes. Scale D (stationary) contains graduations for the various temperature differences desired for computing radiation. As the Alclin slide rule is based on logarithimic scales, calculations in multiplication and division may be accomplished by using scales A and B. A typical problem is worked out in the circular, showing the usefulness of this slide rule. It sells for $5.25 postpaid.



The Alclin Slide Rule.

"COIL" WATER-TUBE STEEL BOILERS, manufactured by the Monitor Boiler Co., Finance Building, Philadelphia, Pa., are brought to the attention of the trade in a circular which shows their unusual construction and explains their adaptability as a heating boiler either for steam or water, as well as for furnishing steam for bakeries, candy factories, hotels and other places where a quick and constant supply is desired at a low fuel cost. It is also described as suitable for furnishing hot water for clubs, hotels, swimming pools, etc. The boiler is of tubular construction and it is stated that the suspended water tubes offer no resistance to expansion and contraction. By the arrangement of the tubes the entire heating surface is direct (both shell and tube), that is, all of the heating surface is in the combustion chamber. The circular contains dimensions and ratings for both steam and water types, as well as ratings for "Coil" steel water heaters. The steam boilers are rated from 250 to 2,400 sq. ft. of direct cast-iron radiation and the water heating boilers, from 400 to 4,000 sq. ft. The manufacturers point out that these boilers are built in accordance with the code of the A. S. M. E.



"Coil" Water-Tube Steel Boiler.

TYCOS SELF-ACTING TEMPERATURE REGULATORS and Tycos Instruments for Steam-Power Plants are presented in recent bulletins issued by the Taylor Instrument Companies, Rochester, N. Y. The Tycos temperature regulators are featured as being especially adapted for industrial processes and the illustrations include a typical application of the regulator to an open hot-water tank. Supplementing the bulletin is a circular on the

Tycos Stormoguide for forcasting the weather. The instrument has the usual figured scale of all aneroid barometers which at all times shows the scientific, or air-pressure, readings. In addition, sections of the dial inside this pressure scale are indicated by letters referring to the weather forecasts on the dial. The Stormoguide is set the same as any barometer, that is, by moving the brass index

Stormoguide (Front View).

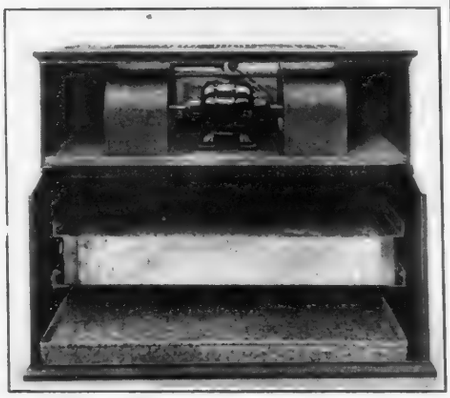
hand so that it is directly over the black indicating hand. Later, when taking a reading, it is necessary to observe if the black hand is "falling" (moving counter-clockwise) or "rising" (moving clockwise). Having determined whether the black hand is rising or falling, reference

Stormoguide (Back View).

is made to the lettered section on which it is located and to the table of weather forcasts on the dial. Adjustments are provided for determining barometer indications at various altitudes above sea-level. Other notable Tycos catalogues, which are issued as parts of a complete catalogue, are devoted, respectively to Tycos pyrometers; industrial thermometers, recording and index thermometers, recording pressure gauges, temperature—controlling devices, and hygrometers for enclosed spaces; Tycos single and double-duty temperature-regulators; and Tycos Type-P temperature regulators. Size of each catalogue 7½ x10½ in.

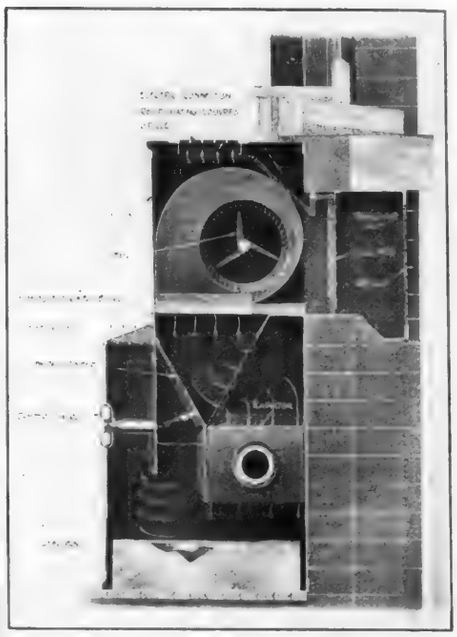
Use of Copper Heaters in Unit Ventilators.

UNIVERSAL UNIT VENTILATION SYSTEM, the units of which are now equipped with extruded copper tube radiators of the type illustrated, are the subject of a new catalogue received from John J. Nesbitt, Inc., Atlantic City, N. J. The use of the copper-tube radiator of the type shown permits an important reduction in the size of the unit itself. The height of the Universal unit, for instance, was formerly 44 in., whereas it is now made 36 in. high, making it possible to install the unit wholly under the average schoolhouse window sill. In addition the unit, when recessed 4 in., requires only 12½ in. aisle space. Another objective gained through the use of the copper-tube radiator is a means of recirculating air without the use of external doors or louvres. This is accomplished by



Universal Unit Ventilator Equipped with Copper Radiator.

incorporating into the new unit a by-pass chamber parallel with the heating chamber, having a damper at the entrance to the heating and by-pass chambers capable of

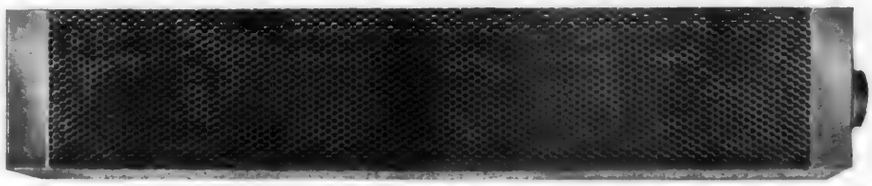


Typical Installation of Universal Unit Ventilator.

excluding all the air from the heating chamber, or any fraction thereof. In addition, it is stated, the radiator has 25% less friction than the type previously used and is capable of heating 1,500 cu. ft. of air per minute, with entering air at zero and leaving air at 90° F. The principle of construction of the extruded copper-tube heater is that described in THE HEATING AND VENTILATING MAGAZINE for October in connection with the product of the United States Cartridge Company. Attention is called in the catalogue to the tests on this type of copper-tube radiator made by the American Radiator Company at the Institute of Thermal Research which

End View at Steam Manifold.

End View at Return Manifold.



Top View of Radiator, Showing Honey-Comb Form of Tubes.

showed the advantages of the new surface and an account is given also of the series of air and steam breakdown tests on a square foot section of this radiator. The radiator was located in the end of a wind tunnel and with automatic valve arrangements. Steam was passed through the section at 15 lbs. pressure for one minute, then the steam valve was shut off and air blown through the section at a velocity of 3000 cu. ft. per minute for one minute without breakdown. This test, it is stated, was equivalent to 25 or 30 years' of actual service with the steam off and on at least fifteen times a day during the cold months. Details of construction are included in the catalogue, together with capacity tables, roughing-in dimensions and a typical specification. There is also reproduced in facsimile a letter from Frank B. Howell of the Institute of Thermal Research, covering the tests made at the Institute on this unit. Size 8½ x 11 in. Pp. 16.

New Trade Publications

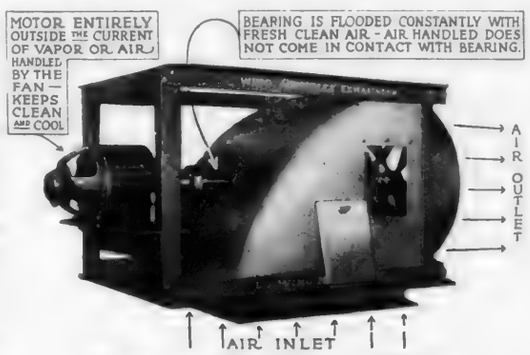
ILLINOIS HEATING SYSTEMS, featuring the Illinois Thermo Modulating System of vapor heating for apartments, hospitals, hotels, schools and residences, are presented in Bulletin No. 21, issued by the Illinois Engineering Co., Chicago, Ill. Special emphasis is laid in the bulletin on the flexibility and automatic operation of the Illinois system which is described as a true vapor system with sealed returns, insuring the fuel economy possible from operating at vapor pressure during mild weather. Special attention is devoted in the bulletin to what is described as the fourth essential feature of a true vapor heating system, namely, an air liberating and seal device which will permit air to pass from the system without appreciable back pressure and which will prevent the return of liberated air. How this is accomplished by the Illinois Heat Retainer (Browne Patent) is explained at length, together with a detailed account of the construction and operation of this device. Included in the illustrations is a typical elevation of a Type A system for large buildings, typical boiler room assembly, Type B system for residences and a basement piping plan for a banking building. The bulletin also contains "Standards for Computing Radiation and Boiler Sizes" as compiled and issued by the Chicago Master Steam Fitters' Association. Several pages at the back of the bulletin are devoted to illustrations of various types of buildings equipped with Illinois heating systems. Size 8½ x 11 in. Pp. 32.

COAL—THE BASIC FUEL is the title of a booklet issued by the Stoker Manufacturers Association, Philadelphia, Pa., and dedicated to the "men in boiler rooms, laboratories and offices who are untiringly seeking ways of conserving resources through the more efficient burning of coal." Two men with the aid of mechanical stokers can handle a boiler room that would require five men if it were hand fired, the booklet states, declaring that this would mean a marked reduction of labor costs and the solution of power plant labor problems. Attention is called also to the fact that the association has published a Condensed Catalog of Mechanical Stokers. Size 5 x 7¾ in. Pp. 16 and cover.

WHITLOCK COIL PIPE CO., Hartford, Conn., has issued a bound volume containing eighteen recent bulletins describing the products of its heater department. The combined bulletins cover practically every variety of heater, including the American Standard copper-coil feed-water heater, Whitlock American storage and instantaneous water heaters and special heaters for all purposes. The first three bulletins are devoted to feed-water heaters, copper-coil type, water-tube type and straight tube-floating head type. The use of feed-water heaters is advocated because, it is stated, it will increase the economy, capacity and life of the boiler. Whitlock American instantaneous heaters, copper-coil pattern, Type A-C, are described in Bulletin No. 24—Series No. 2, together with an illustration of the heater and a table of standard sizes, dimensions and weights. Another bulletin is devoted to the Berryman pattern, Type R, and a third to the straight tube, floating-head pattern, Type R. The volume contains also bulletins giving conversion tables for the rapid calculation of the capacities of steam-actuated water heaters under varying conditions, a description of the company's fuel-oil heaters, Types C and R, heat exchangers, storage heaters, correct design of water heating systems for laundries, utilization of waste-steam in dairies, and a circular on Whitlock piping. Size 6 x 9.

WING-SCRUPLEX FANS AND WING-SCRUPLEX EXHAUSTERS are presented in two attractive bulletins just published by the L. J. Wing Mfg. Co., 352-362 West 13th St., New York. The fan bulletin gives a very clear idea of the principles involved in Wing-Scruplex fan construction, both in causing a uniform velocity over the entire area of the blades and in connection with the effect of wind on this fan which permits it to deliver its air effectively despite the wind. The construction of the unit is concisely described, with accompanying illustrations, followed by capacity data tables for the various sizes, designed either for direct or alternating current, and including high-speed fans. Under "Why Ventilation Pays" are given some useful data on figuring the required amounts of air, and in selecting and locating the fan. The Wing-Scruplex Exhauster bulletin starts off by emphasizing the importance of keeping the motor where it will remain clean, cool and accessible. How the Wing-Scruplex exhauster meets these conditions is explained by the statement that it is (1) an encased fan, with the motor outside; (2) it is designed for use with duct work; (3) it is designed to handle air economically at any static pressure which is considered good commercial practice in ventilating work; and (4) it is small in dimensions, light in weight and easily installed. Rules are given for the selection of exhausters for a wide variety of duties and these are followed by capacity and horsepower tables, dimension tables and price lists. The concluding pages show some interesting installations. Size 3½ x 6 in. Pp. 16, each.

Design of Wing-Scruplex Fan.


MOTOR ENTIRELY OUTSIDE THE CURRENT OF VAPOR OR AIR HANDLED BY THE FAN — KEEPS CLEAN AND COOL
BEARING IS FLOODED CONSTANTLY WITH FRESH CLEAN AIR - AIR HANDLED DOES NOT COME IN CONTACT WITH BEARING.
AIR OUTLET
AIR INLET

Design and Operation of Wing-Scruplex Exhauster.

HOPPES FEED-WATER HEATERS and Feed-Water Purifiers are the subject of a recent catalog issued by the Hoppes Mfg. Co., Springfield, O. The new catalog supplements and gives in greater detail the Hoppes steam specialties which were described in a recent publication of the company. In general Hoppes feed-water heaters are divided into three classes, the cast-iron horizontal construction, the cast-iron vertical construction and the standard steel construction. The company presents four different types of the first general class: Class R, adapted particularly to handling waters of a corrosive nature; Class H, practically the same as Class R, but having a larger storage capacity; Class T, designed to meet requirements for an all cast-iron heater, and Type A, a non-corrosive heater for handling waters containing little solids. All of these classes are described

in detail in the new catalog and numerous illustrations presented. Considerable space is devoted also to a description of the cast-iron vertical construction heater, while the latter part of the book is given over to the two types of standard steel construction heaters, the "standard" especially adapted to handling waters highly impregnated with scale-forming ingredients and the standard type "B" heater, adapted to handling practically pure water. Space is given also to the Hoppes V-notch meter, recorder and integrator and to the Hoppes steam separators, oil eliminators and exhaust heads. Size 6 x 9 Pp. 80 and cover.

WRIGHT-AUSTIN BOILER TRIMMINGS, covering particularly safety alarm water columns and trimmings manufactured by the Wright-Austin Co., Detroit, Mich., are presented to the trade in a catalogue received from the company. This booklet superseded Catalogue No. 1240; it is listed as Bulletin No. 500. In addition to a general description of the safety alarm water column, views are included of the water column as installed and of

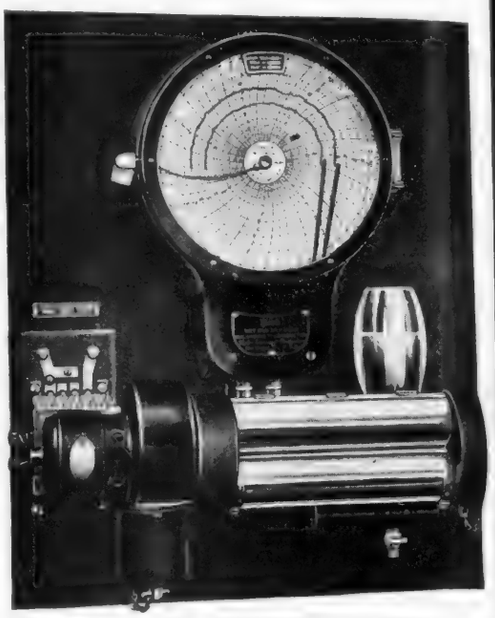
W-A Combined High and Low Water Alarm Column.

the interior construction. Two kinds are made by the company. One gives the high-water alarm and also the low-water alarm, while the other gives the signal for low water only. One single, inside operating unit sounds both the high and low-water alarms. It has but one vertical valve and one round float. The float is without any rods or connections, merely idling on the water between the high and low levels. The bulletin also covers the Victor Type water column, the Victor Jr. alarm column, followed by prices, weights and connection dimensions for the safety alarm water column. Directions for installation are also given. The remaining pages are devoted to boiler trimmings, including the Wright-Austin automatic pump governor, automatic boiler feed-water regulator, and control valve. Size 6 x 9 in. Pp. 24.

VALVE WORLD FOR OCTOBER, issued by the Crane Co., Chicago, contains the tenth number of its supplement, the Crane Business Survey. Business generally, the Survey states, has settled down to a steady jog without any extreme pressure for production, but yet active enough to absorb a very fair proportion of the productive capacity of the country. There is no longer any shortage of labor, except possibly in the building trades in certain localities. General business is very good in most of the large cities of the east but not so good at other points, according to the Survey. Outside of Jacksonville, Fla., where there is considerable activity, the Survey find business in the southern zone a little slower. In the northern zone business for the most part is reported comparatively slow, but with little unemployment and a good undertone. Little change is reported for the central zone where business is generally good. The western zone also is reported in good condition. In Montreal and Toronto, general business is satisfactory, but elsewhere in Canada there is much to be desired, the Survey finds. The feature article in the *Valve World* tells the story of the establishment in Washington D. C. of the "Home Sweet Home" house, a national demonstration for better homes in America.

TYPE T HEAVY-DUTY RELIANCE MOTORS for direct current, manufactured by the Reliance Electric & Engineering Co., Cleveland, O., are described in Bulletin No. 2014, recently issued by the company. The booklet calls attention to the tendency in motor design to produce the lighter types of motor for which there is a greater demand and to neglect the small proportion of users of the heavy types. Type T heavy-duty motor was designed particularly to meet this demand for the more rugged motor. The book is profusely illustrated with pictures of the Type T motor in various stages of manufacture, together with several reproductions of actual installations. Size 8 x 10½. Pp. 32 and cover.

TYCOS RECORDING AND INDEX THERMOMETERS, mercury-actuated, vapor tension-actuated and gas-actuated, together with recording gauges for pressure, vacuum and draft, are discussed in Catalogue Part 8000, (September, 1923 edition) issued by the Taylor Instrument Companies, Rochester, N. Y. These instruments automatically write in ink on a revolving paper chart a continuous record of the temperature to which the bulb is subjected. The chart shows also the length of time for each operation and the length of time the apparatus is idle. The same new-design pressed-brass, moisture-and-dust proof case, finished in dull black or white enamel, the same clock movement, the same mechanism for transmitting motion from spring to pen-arm adjusting device are used for all Tycos capillare recording thermometers. The catalogue shows the various styles which can be supplied regularly. The catalogue also goes at length into the three types made, and the explanation of their operation is graphically illustrated. Tycos recording thermometers, it is added, can be equipped with 1-point or 2-point electric-contact attachment for use on dry-battery circuit, adjustable for any temperature point or points on the chart. These



Tycos Wet and Dry-Bulb Recording Thermometer.

contacts are attached to the coil inside the case and the mechanism is entirely separate from that which actuates the pen-arm. Full-circle-type index thermometers can be similarly equipped for one point only. Size 7½ x 10¾ in. Pp. 44.

ANTI-FRICTION BEARINGS IN THE STEEL MILL is the title of a 51-page paper by A. M. MacCutcheon, chief engineer of the Reliance Electric & Engineering Co., Cleveland, O., which will be found of general interest and value to users and designers of machinery and power equipment. The paper was one presented before the Association of Iron and Steel Electrical Engineers, and includes the discussion on the subject. The paper contrasts the anti-friction bearing with the oil-ring type of bearing and shows the advantages possessed by each type. Additional copies of the paper are available from the Reliance Electric & Engineering Co., Cleveland, O.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

HEATING

Securing Economy in the Heating of Stations and Buildings, R. W. Noland. Ry. Eng. & Maintenance, vol. 19, no. 7, July 1923, pp. 278-280, 3 figs. Fundamental principles involved in various types of systems. Data collected by means of questionnaire sent to 100 representative railways of the country. 40c.

Outlook Grows Brighter

Finding Of Right Goods For Market is Leading Problem—Reduction of Overhead Charges is Advisable

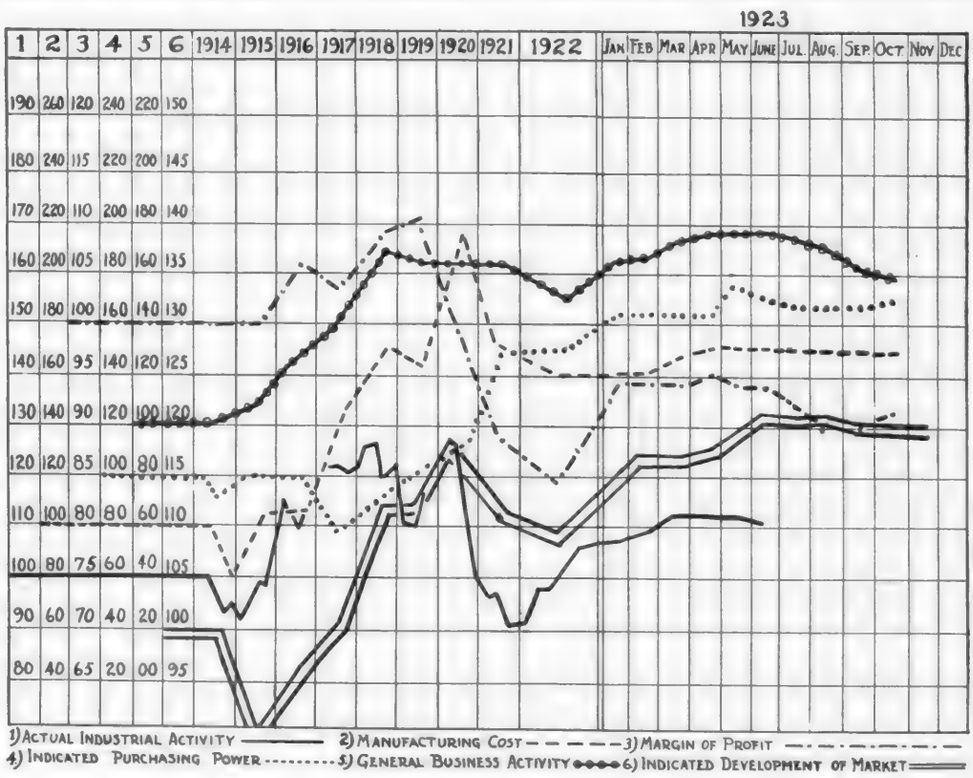
Especially Prepared for THE HEATING AND VENTILATING MAGAZINE

BY L. W. ALWYN-SCHMIDT

Business is getting better again, there is no doubt about this fact, although there is little yet in the situation itself indicating a decisive improvement. On the contrary, all the usual indicators are still keeping comparatively low. Some have shown even a further but very narrow decline. Nevertheless, there is plenty of reason to expect an early renewal of all commercial activity. This will bring the market back upon the level experienced during the early part of the present year. factories going on a profit level not much below the present.

But manufacturers and retailers will have to realize that purchasing power can only be comparative. It can mean only the ability of the nation to spend money for purchase. To make for good business there must be also the will to spend. And it is this latter only that provides the motive power for a regular flow of merchandise from producer to consumer.

The present problem, therefore, is not of today. The public is ready to buy. To produce a regular flow of merchandise all that is needed now is to tell the consumer about his opportunity. Unfortunately there is evidence of a shrinkage, not of the advertising expenditure itself, but in the variety of offerings. This is very regrettable because advertising has never paid better than at this very time. How true this is may easily be gleaned from the fact that all those industries which have advertised consistently during



Analysis of Business Conditions at End of October.

Normally nobody would have worried about the present decline but business men have become nervous during the last year. They do not trust the strength of the market. Also there are to be found weak points in the structure which will have to be eliminated as we go along. This has been done already most successfully in the building and coal mining industries.

But the depressing influences of such causes upon the market can be of temporary character only and should not give any special concern. There is nothing to fear as long as the purchasing power of the nation remains where it is and as long as manufacturers are able to keep one of finding the buyer but rather of finding the right goods. Once have the right goods at the right price and the buyers will be ready enough to come in the market. As it is the consumer's money now flows into channels not directly connected with the turnover of merchandise. Life insurance and savings banks have been apparently the principal recipients. Little money has gone into investments, the small investor having retired from this form of investing as the result of the so-called bucket shop war.

With money a-plenty and goods galore there should be little difficulty of bringing buyer and seller together. Never was there an "advertiser's" market like that the last summer, have done well. Witness the unprecedented sales of automobiles, the similarly large sales of toilet goods, and a few lesser examples. Right advertising just now will turn the buyer from watchful waiting to open purchasing. All that he wants in fact is a good and sensible occasion to spend money.

The labor situation remains normal with wages moving upon a fair level, leaving the wage earner a good surplus over his indispensable purchases. The small increase in food prices, especially in the larger cities and industrial districts can have little effect upon his domestic budget.

However, attention must be drawn again to the slowness of commercial collections. The fact that these complaints are more frequent in purely commercial transactions, while practically absent between retailer and consumer, makes it appear that this situation has much to do with conditions in the industry itself.

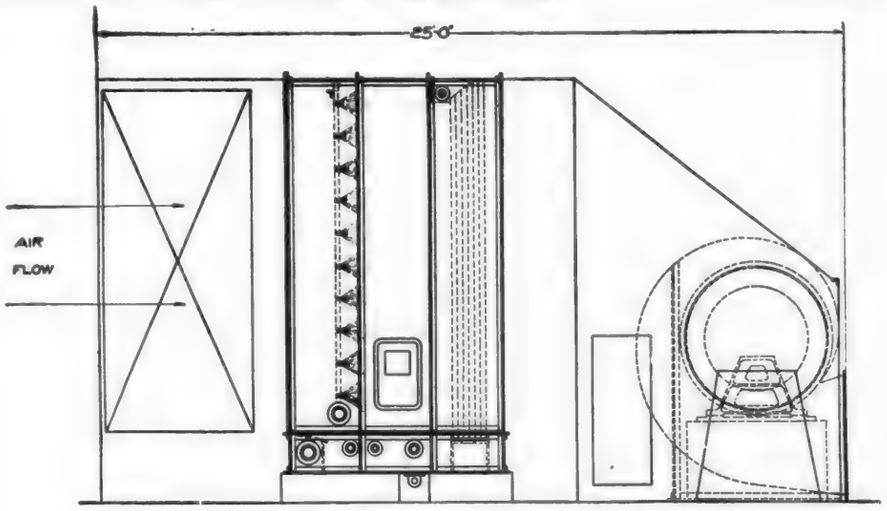
An explanation probably is to be found in the comparatively high overhead of industrial operation inherited from our after-war prosperity. Overhead during this time in the form of rent, high salaries, and similarly high personal expenditures had grown very rapidly and entirely out of proportion to the rest of the expenses. When the decline came prices had to be lowered and the profits reduced. We have still with us the results of this enforced reduction. But it was not quite as easy to reduce the overhead items, including rent, transportation, sales expenses, and salaries. These, then, continue to exert their influence and they form a veritable giants' load on the shoulders of all industrial operation. While earnings were good the load was not felt so heavily. It has certainly a decided effect upon the bank holdings of all commercial enterprises, and, in turn, of course, upon commercial collections. The curtailment of overhead expenditure, therefore, must form an important part of the financial policy of every business. The money saved can best be used by increasing bank holdings and for the relief of current indebtedness.

Requirements of Steel Mill Ventilation

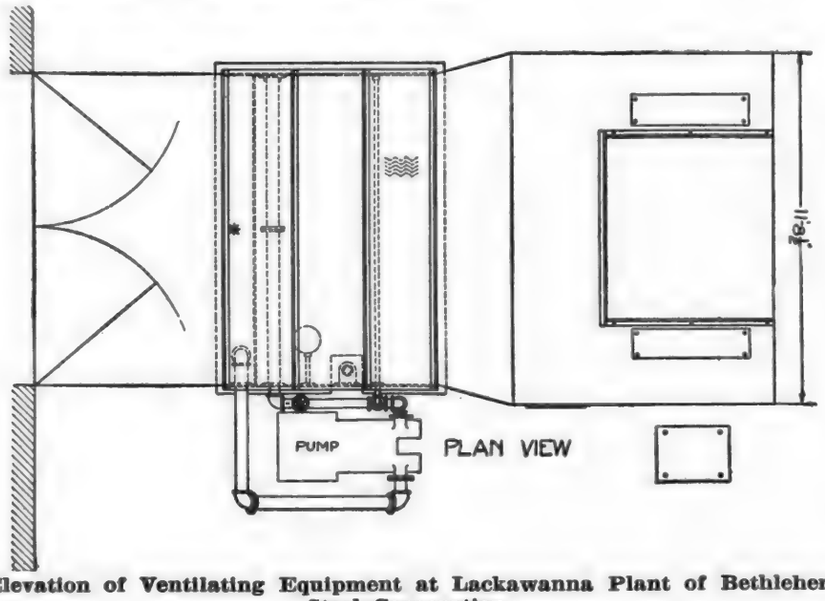
Motor drive is now accepted as the "thing to be done" in the mill of today. This is so because of the proven greater reliability of the electric drive in operation over the steam engine, its greater economy and better power distribution, diminished maintenance charges and greater speed. Ventilation of motors has likewise advanced from the position of a necessary but minor auxiliary to that of a major element in efficient plant operation. A typical illustration of this development is to be seen in the ventilating equipment about to be installed in the new electrified mill No. 2 at the Lackawanna Plant of the Bethlehem Steel Corporation. This equipment will consist of two No. 9 double-width Turbo-Conoidal blowers of the Buffalo Forge Company make, each capable of delivering 60,000 cu. ft. of air per minute. Both will be of top horizontal discharge. The blowers, requiring 44.5 B. H. P., will operate at 715 R. P. M. and will be direct-connected to electric motors. Bearings for these fans will be mounted on independent pedistals.

Carrier air washers of standard gauge will also be installed to clean and cool the air delivered by the blowers. These washers use a finely-divided spray and are the type now generally furnished for use with steam turbine generator sets.

A 4-in. single-stage centrifugal pump operated at 1140 R.P.M. and manufactured by the Buffalo Forge Company, will supply the pressure for these washers. The pump itself will be fitted with brass impellers, brass glands and brass-covered shaft.



Ventilating Equipment for Lackawanna Plant of Bethlehem Steel Corporation.



Elevation of Ventilating Equipment at Lackawanna Plant of Bethlehem Steel Corporation.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE HEATING AND VENTILATING MAGAZINE published monthly at Cooperstown, N. Y., for October 1, 1923.

State of New York, County of New York, ss:

Before me, a notary public in and for the State aforesaid, personally appeared A. S. Armagnac, who, having been duly sworn, according to law, deposes and says that he is the editor of The Heating and Ventilating Magazine, and that the following is, to the best of his knowledge and belief, a true statement of said publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443 Postal Laws and Regulations printed on the reverse of this form to wit:

1. That the names and addresses of the publishers, editor, managing editor, and business managers are:

Publisher, Heating and Ventilating Magazine Co., 1123 Broadway, New York, N. Y.

Editor, A. S. Armagnac, 1123 Broadway, New York, N. Y.

Managing Editor, None.

Business Manager, Gustave Petersen, 1123 Broadway, New York; N. Y.

2. That the owners are: (Give names and addresses of individual owners, or if a corporation, give its name and the name and address of stockholders owning or holding 1 per cent or more of the total amount of stock.)

Heating and Ventilating Magazine Co., 1123 Broadway, New York, N. Y.

A. S. Armagnac, 1123 Broadway, New York.

Gustave Petersen, 1123 Broadway, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain, not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustee, hold stock and securities in a capacity other than that of a bona-fide owner and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

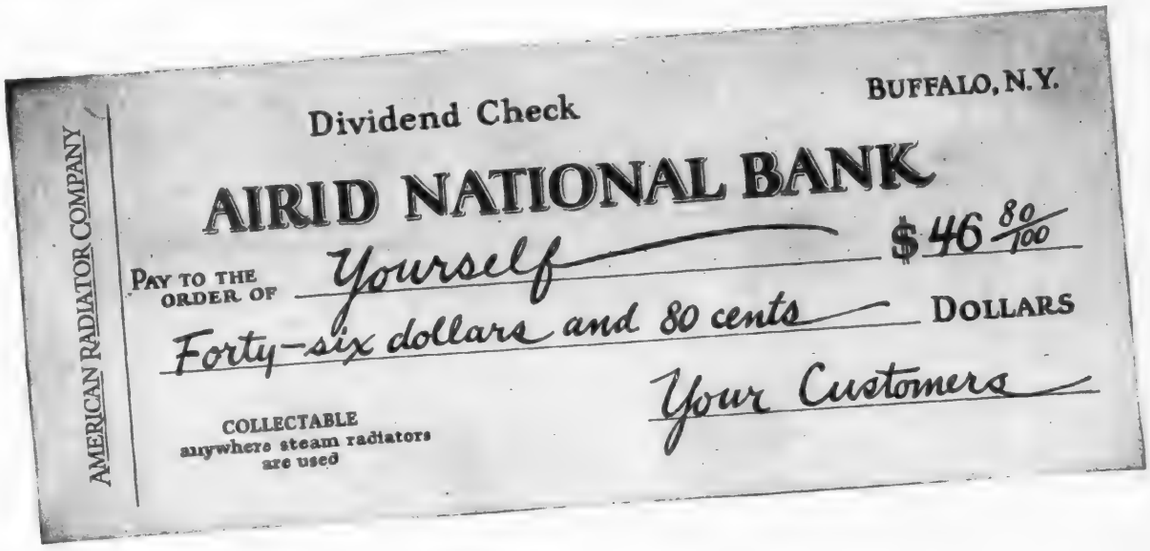
A. S. ARMAGNAC, Editor

Sworn to and subscribed before me this 28th day of September, 1923.

A. L. Scantlebury.

Notary Public Kings County No. 631.
Certificate filed in New York.
County Clerk's No. 455.

New York County Registers No. 5479.
(My term expires March 30th, 1925.)



Are you getting your dividends?

EVERY Heating Contractor in the country has been mailed a check like the one above.

It is the cover of a leaflet that explains just how you can get Airid Air Valve profits—without labor—without risking a penny.

Airid advertising is making sales for thousands of Heating Contractors. If you are not getting them, right now is the time to begin. The heating season has started, heating plants are in operation and thousands of owners are buying Airid Air Valves to make cold radiators warm.

Will you get your share of this easy business? The readers of Airid advertising will come to buy from you if you let them know you have a stock by displaying Airids in your window in display boxes.

MADE AND GUARANTEED BY

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

1807 Elmwood Avenue Dept. S-79 Buffalo, N.Y.

(Stock No. 500)

AIRID Air Valve

Rids the radiator of cold air

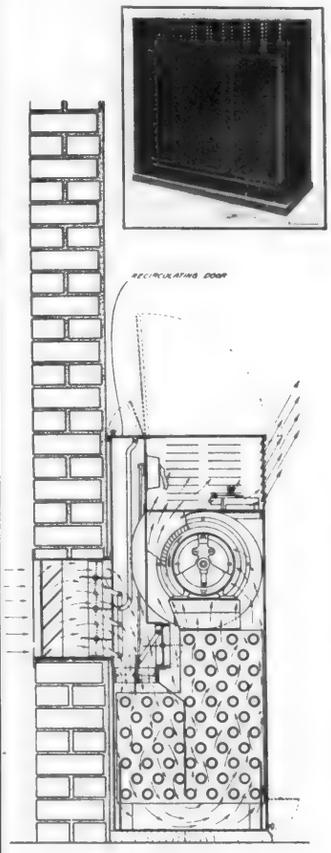
THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

PORTABLE UNIT VENTILATORS

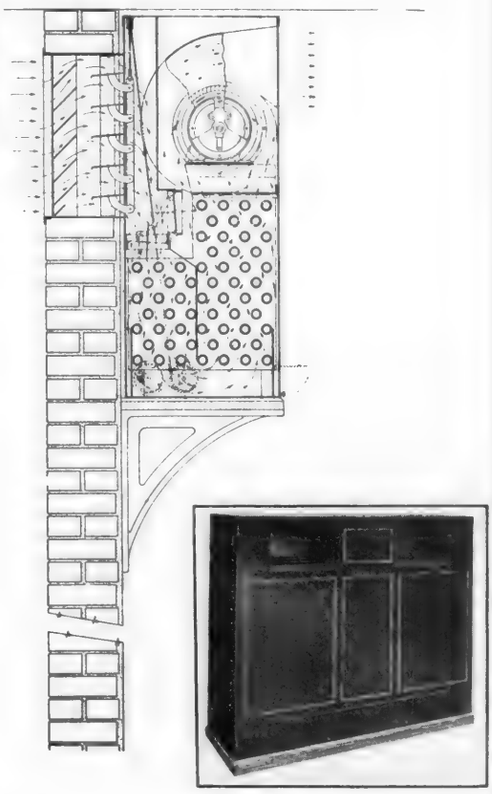
The Heatovent

Characteristic features of the Heatovent, manufactured by the Buckeye Blower Co., Columbus, O., are its two low-speed multiblade fans, its special steam pipe-coil radiator and the novel design of its steel cabinet. The fan wheels are mounted directly on opposite ends of the motor shaft. Air is drawn in from out-of-doors, or may be recirculated, if desired. It passes through the pipe-coil heater and is then discharged from the cabinet into the room through small louvre openings at the top of the cabinet and across the front and ends. The final temperature of the air is regulated by a balanced mixing damper in the air intake which directs all or part of the air through the heater, allowing the balance to by-pass directly to the fans. Uniform final temperature of the air leaving the cabinet is obtained by the mixing of the cold and warm air in the fans

Each Heatovent is provided with a slow-speed 40° C. electric motor, mounted on an insulated base on top of the heater structure. A multiblade fan wheel is keyed to each end of the motor shaft. By this means all rotating parts are mounted entirely independent of the casing. This is done to prevent any magnetic hum from being transmitted through the casing. Care is also taken to secure dynamic balance so as to prevent vibration. Standard motors are wound for 115 volts, direct current. A motor rheostat is used to regulate the speed of the fans.



Type C Heatovent.



Type D Heatovent.

(Continued on Data Sheet No. 6-J)

PORTABLE UNIT VENTILATORS—The Heatovent | No. 6-I

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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

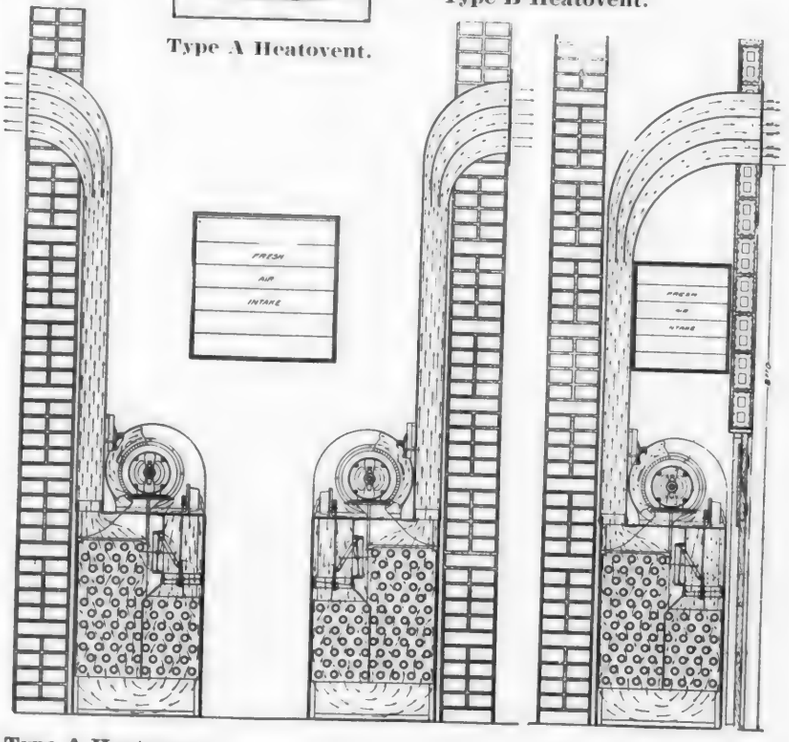
PORTABLE UNIT VENTILATORS

The Heatovent

(Continued from Data Sheet No. 6-I)

Type A Heatovent.

Type B Heatovent.



Type A Heatovent. Type B Heatovent.

(Continued on Data Sheet No. 6-K)

PORTABLE UNIT VENTILATORS—The Heatovent (Continued). | No. 6-J

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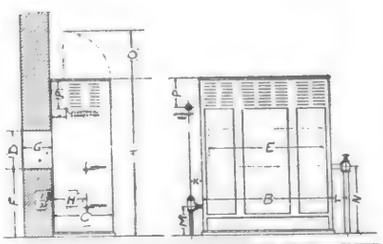
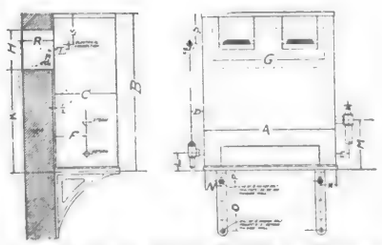
PORTABLE UNIT VENTILATORS
The Heatovent

(Continued from Data Sheet No. 6-J)





Unit No.	A	B	C	D	E	F	G	H	K	L	M	N	O	P	R	Steam	Return
36C	40½	12	18½	9	24			10½	1⅝	4½	9¼	21	16½	12	5	1½"	1"
37C	40½	12	18½	9	24			10½	1⅝	4½	9¼	21	16½	12	5	1½"	1"
38C	40½	40	18½	9	12			10½	1⅝	4½	9¼	21	16½	12	5	1½"	1"
46C	40½	40	18½	9	12			10½	1⅝	4½	9¼	21	16½	12	5	1½"	1"
47C	40½	40	18½	9	12			10½	1⅝	4½	9¼	21	16½	12	5	2"	1½"
48C	40½	40	18½	12	12			10½	1⅝	4½	9¼	21	16½	12	5	2"	1½"
56C	40½	40	18½	12	12			10½	1⅝	4½	9¼	21	16½	12	5	2"	1½"
57C	40½	40	18½	12	12			10½	1⅝	4½	9¼	21	16½	12	5	2"	1½"
58C	40½	40	18½	12	12			10½	1⅝	4½	9¼	21	16½	12	5	2"	1½"
66C	40½	40	18½	12	12			10½	1⅝	4½	9¼	21	16½	12	5	2"	1½"
67C	40½	40	18½	12	12			10½	1⅝	4½	9¼	21	16½	12	5	2"	1½"
68C	40½	40	18½	12	12			10½	1⅝	4½	9¼	21	16½	12	5	2"	1½"

Unit No.	A	B	C	D	E	F	G	H	K	L	M	N	O	P	R	S	T	Steam	Return
36D	42	12	18⅝	18¼	4½	10½	24			5⅛	17⅛	5	15	3½		12	5	1½"	1"
37D	42	12	18⅝	18¼	4½	10½	24			5⅛	21	5	15	3½		12	5	1½"	1"
38D	42	12	18⅝	18¼	4½	10½	24			5⅛	24⅝	5	15	3½		12	5	1½"	1"
46D	40½	42	18⅝	18¼	4½	10½	12			5⅛	17⅛	5	15	3½		12	5	1½"	1"
47D	40½	42	18⅝	18¼	4½	10½	12			5⅛	21	5	15	3½		12	5	1½"	1"
48D	40½	42	18⅝	18¼	4½	10½	12			5⅛	24⅝	5	15	3½		12	5	1½"	1"
56D	40½	42	18⅝	18¼	4½	10½	12			5⅛	17⅛	5	15	3½		12	5	2"	1½"
57D	40½	42	18⅝	18¼	4½	10½	12			5⅛	21	5	15	3½		12	5	2"	1½"
58D	40½	42	18⅝	18¼	4½	10½	12			5⅛	24⅝	5	15	3½		12	5	2"	1½"
66D	40½	42	18⅝	18¼	4½	10½	12			5⅛	17⅛	5	15	3½		12	5	2"	1½"
67D	40½	42	18⅝	18¼	4½	10½	12			5⅛	21	5	15	3½		12	5	2"	1½"
68D	40½	42	18⅝	18¼	4½	10½	12			5⅛	24⅝	5	15	3½		12	5	2"	1½"

DIMENSIONS OF TYPE C SERIES **DIMENSIONS OF TYPE D SERIES**

Room Temperature 70 degrees Fahr — Steam at Zero pounds gauge pressure

		Entering Air -10 F			Entering Air Zero F			Entering Air +10 F			Entering Air +20 F		
Unit No.	Cu Ft Air per min	Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad
36	750	68	76	Add 6	73	70	10	78	64	26	84	59	44
37		82	90	Omit 38	88	84	56	91	76	66	96	70	81
38*		94	101	" 75	98	94	85	102	86	100	106	78	114
46	1000	68	102	Add 8	73	93	13	78	85	34	84	78	59
47		82	120	Omit 50	88	112	75	91	101	88	96	93	108
48*		94	135	" 100	98	125	114	102	115	134	106	105	152
56	1250	68	127	Add 10	73	116	16	78	106	42	84	98	74
57		82	150	Omit 63	88	140	94	91	126	110	96	116	135
58*		94	169	" 125	98	156	142	102	144	167	106	131	190
66	1500	68	153	Add 12	73	140	20	78	128	53	84	118	89
67		82	180	Omit 75	88	168	112	91	152	132	96	140	162
68*		94	202	" 150	98	188	170	102	172	201	106	158	228

* Type D Heatovents only.

Room Temperature 70 degrees Fahr — Steam at five pounds gauge pressure

		Entering Air -10 F			Entering Air Zero F			Entering Air +10 F			Entering Air +20 F		
Unit No.	Cu Ft Air per min	Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad
36	750	74	82	13	80	77	31	85	71	47	90	65	63
37		90	97	63	95	91	78	99	84	92	104	77	106
38*		104	111	106	107	101	117	111	95	132	115	87	142
46	1000	74	110	17	80	102	42	85	94	63	90	86	84
47		90	130	84	95	121	104	99	112	122	104	103	142
48*		104	148	142	107	135	156	111	126	176	115	116	190
56	1250	74	138	21	80	128	52	85	118	78	90	108	105
57		90	163	105	95	152	130	99	140	152	104	129	177
58*		104	185	177	107	169	195	111	158	220	115	145	237
66	1500	74	156	25	80	153	63	85	141	94	90	129	126
67		90	195	126	95	182	156	99	168	182	104	155	198
68*		104	222	213	107	203	234	111	189	264	115	174	285

*Type D Heatovents only

Engineering Data on Types C and D Heatovent.

(Concluded on Data Sheet No. 6-L)

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THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. C.

PORTABLE UNIT VENTILATORS

The Heatovent

(Concluded from Data Sheet No. 6-K)

Uniformity in size, shape and in the position of the fans in the wheels is secured through the process of manufacture, by which the fan wheels are die-formed and held in a jig as they are welded into the wheel. Each half wheel is formed separately and mounted on the central aluminum disc, as it was found that these short half-length blades make a stronger and more rigid wheel than one continuous blade.

No. 12 and No. 14 gauge stretcher leveled furniture steel is used in the construction of the Heatovent cabinet. Four types are regularly made, Type C being

ENGINEERING DATA ON TYPES A AND B HEATOVENT

Room Temperature 70 degrees Fahr — Steam at Zero pounds gauge pressure

Unit No	Cu Ft air per min	Entering Air -10 F			Entering Air Zero F			Entering Air +10 F			Entering Air +20 F		
		Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad	Final Temp	Cond lbs per hour	Omit Sq Ft Rad
31	900	*68	94	Add 8	73	84	11	78	77	30	84	70	53
32		82	108	Omit 45	88	101	[illegible]	91	91	80	96	84	97
33		94	122	" 90	98	113	106	102	103	120	106	95	136
34		104	133	" 128	107	122	140	112	114	162	115	104	171
35		113	144	" 165	116	133	174	121	124	193	123	112	200
41	1200	68	122	Add 10	73	112	15	78	102	[illegible]	84	94	71
42		82	144	Omit 60	88	134	90	91	128	103	96	112	130
43		94	162	" 120	98	150	142	102	138	161	106	126	182
44		104	178	" 171	107	164	188	112	152	216	115	139	228
45		113	192	" 219	116	177	233	121	166	256	123	150	267
51	1500	68	153	Add 12	73	140	19	78	128	50	84	118	89
52		82	180	Omit 75	88	168	113	91	152	133	96	140	162
53		94	202	" 150	98	188	177	102	172	201	106	158	236
54		104	222	" 214	107	204	234	112	190	270	115	174	285
55		113	240	" 275	116	222	290	121	207	320	123	187	332
61	1800	68	188	Add 15	73	168	23	78	153	60	84	140	112
62		82	216	Omit 90	88	202	136	91	182	159	96	168	196
63		94	245	" 180	98	225	213	102	207	241	106	189	284
64		104	268	" 257	107	245	281	112	228	324	115	208	342
65		113	288	" 331	116	266	348	121	248	388	123	225	400

Room Temperature 70 degrees Fahr. — Steam at 5 pounds gauge pressure

Unit No	Cu Ft Air per min.	Final Temp.	Cond. lbs per hour	Omit Sq Ft. Rad	Final Temp.	Cond. lbs per hour	Omit Sq Ft. Rad	Final Temp.	Cond. lbs per hour	Omit Sq Ft. Rad	Final Temp.	Cond. lbs per hour	Omit Sq Ft. Rad
31	900	74	100	15	80	92	38	85	85	57	90	77	75
32		90	117	76	95	109	93	[illegible]	101	110	104	93	128
33		104	133	128	107	122	140	111	114	158	115	104	171
34		115	146	171	118	135	182	121	124	192	125	116	208
35		125	158	208	128	147	219						
41	1200	74	132	20	80	122	50	85	113	75	90	103	101
42		90	156	100	95	145	125	99	134	146	[illegible]	124	170
43		104	178	170	107	162	187	111	152	210	115	140	228
44		115	196	228	118	180	241	121	166	256	125	154	276
45		125	211	276	128	196	291						
51	1500	74	156	25	80	153	63	85	141	94	90	129	126
52		90	195	126	95	182	156	99	168	182	104	155	198
53		104	222	213	107	203	234	111	189	264	115	174	285
54		115	245	285	118	225	302	121	207	320	125	192	347
55		125	265	346	128	245	365						
61	1800	74	198	30	80	184	76	85	170	113	90	155	151
62		90	235	150	95	219	187	99	202	220	104	186	255
63		104	267	255	107	244	280	111	227	317	115	209	342
64		115	294	342	118	270	364	121	250	385	125	231	415
65		125	317	415	128	294	438						

designed for installation directly in the room to be ventilated; Type D for basement wall installation at the ceiling line to keep the radiator as high above the water-line of the boiler as possible, discharging the air horizontally across the ceiling; Type A designed to be built in a space adjacent to the room to be ventilated with the access door or panel in the rear; and Type B, to be built in a niche in the wall within the room to be ventilated with access door or panel in the front. As a general rule, each unit is used in connection with direct radiation for heating. Type A is described as especially adaptable for old school buildings which were designed with a common wardrobe between two classrooms. In such cases the outer end of the wardrobe is partitioned off and provided with an outside fresh-air intake. A Heatovent for each room is then installed in this space. Both Types A and B introduce the fresh warm air into the room through a heat register placed 8 ft. above the floor line at a temperature above 70° F. and with a velocity of 300 ft. per minute. This arrangement complies with the laws in effect in some states requiring fresh air admission at that level.

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Trade Mark Reg.

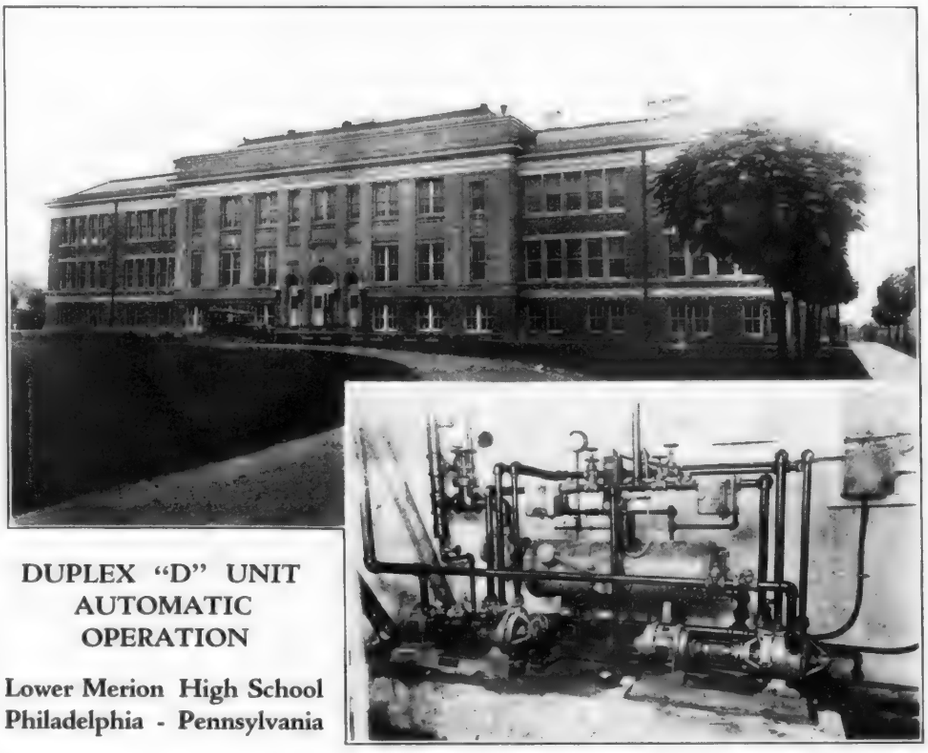
Typical JENNINGS Installations

A Series

PHILADELPHIA

- Independence Hall
- Sylvania Hotel
- Atlantic Refining Company Building
- Pennsylvania Warehousing & Safe Deposit Company
- Lit Brothers Department Store
- Bell Telephone Company of Pennsylvania
- Baltimore & Ohio Railroad Company
- Philadelphia Institute for Insane
- Stanley Company of America
- City Center Building
- Corn Exchange National Bank
- Ford Motor Company
- Public Ledger Building
- David Lupton Sons Company
- Fayette R. Plumb, Inc.
- Packard Motor Car Company
- Philadelphia Electric Company
- St. Peter & St. Paul Cathedral
- Schlorer Delicatessen Company
- Temple University
- Westinghouse Electric & Manufacturing Company Building
- Green Hill Farms Apartment Hotel

EFFICIENT HEATING *demands the* JENNINGS PUMP



DUPLEX "D" UNIT AUTOMATIC OPERATION

Lower Merion High School Philadelphia - Pennsylvania

Capacity each pump 40,000 sq. ft. direct radiation, air capacity 25 cubic feet per minute in addition to a water capacity of 60 gallons per minute. The motors are only 3 horse power.

No matter how well designed a Return Line Heating system may be, its satisfactory operation is largely dependent upon the proper functioning of the Vacuum Return Line Pump. The Jennings pump has proven on thousands of installations that it possesses the features necessary for proper operation under the most extreme conditions.

Jennings Return Line pumps are simple in construction, containing but one moving element, running with a clearance in the casing. They are simple to install and operate, they require little floor space and are noiseless in operation. Their use results in a marked economy in coal. Many users hold that they more than pay for themselves in this respect alone. A Jennings pump on your system means quick heat in the most isolated radiators at a minimum steam pressure.

Now is the time to consider equipment for replacements and new installations for this season. Our Engineering Department is at all times ready to render service on problems relating to heating.

NASH ENGINEERING CO.

South Norwalk, Conn., U. S. A.

Trade and Miscellaneous Notes

Miscellaneous Notes

Department of Heating, Ventilation and Sanitation of the College of Industries of the Carnegie Institute of Technology, Pittsburgh, has announced a notable increase in the number of students who are taking this course in the night classes. Students of this department range from apprentices to contractors and number seventy-five. Of the 1,200 students enrolled in the night classes of the college, more than 50% have signed to take courses in the building trades. Two reasons are assigned for this increased interest, one the high wages now prevalent and the other is due to the growing interest that labor unions are showing in educational facilities for their respective apprentices.

American Manufacturers are bringing in manufacturing material from abroad at the rate of over $2,000,000,000 a year, according to a recent announcement of the Trade Record of the National City Bank. Imports of manufacturing material for the first seven months of 1923 total more than 1⅓ billion dollars, indicating that the total for the year will approximate $2,350,000,000 or about 50% in excess of last year in stated value. Our exports of manufacturers, the Record stated, for the year will exceed $2,000,000,000 and food stuffs nearly $1,000,000,000.

Second National Exposition of Power and Mechanical Engineering will be held in the Grand Central Palace in New York December 3 to 8, 1923. Contracts for space already have been signed by 136 firms, thus insuring a well-balanced exhibition of the latest developments in the science of generating and utilizing power. The dates of the exposition will coincide with the annual meetings of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers.

Building Construction continued to decline in volume through September, although the drop from August was only 3%, according to the F. W. Dodge Corporation. The total September building contracts in 36 eastern States, including about seven-eighths of the total construction volume of the country, amounted to $288,931,700. In the 27 States for which records were kept last year the drop over September, 1922, amounted to 7%. The construction volume for the first nine months of this year in 36 States amounted to $3,012,610,500. Building contracts in September included the following: residential, 39%; public works or utilities, 19%; business buildings, 15%; industrial buildings, 13%; and educational buildings, 5%.

National Association of Practical Refrigerating Engineers, which will hold its fourteenth annual convention in Memphis, Tenn., December 12 to 15, 1923, has arranged to hold its business sessions and present its exhibits at the Scottish Rite Cathedral. Convention headquarters will be at the Hotel Chisca. William F. Davis, 630 Jackson Ave., Memphis, is chairman of the Exhibits Committee.

National Trade Extension Bureau of the heating and plumbing industries has announced it is looking for a man to act as field representative for the bureau. While the bureau would prefer a man who has had some contact with the industry he does not necessarily have to be a practical man. The chief qualifications required are the ability to make a good appearance, and the oratorical ability to place the facts supplied him before groups of heating and plumbing contractors and at luncheon meetings of civic organizations.

Chicago, Ill.—Francis X. Busch, corporation counsel, has ruled that the

TEN REASONS WHY-

AUTOVENT MOTOR DRIVEN PROPELLER FANS ARE BETTER

1. Motor will operate indefinitely under full load at the correct temperature for highest fan efficiency.
2. Protected motor prevents air containing grease, acids, moisture, grit or other foreign substances from contaminating motor windings.
3. Elimination of costly break downs and burn outs, which in many instances are caused by contamination of motor windings.
4. Motor windings, after years of service, are as clean as when originally installed.
5. Operating expense is reduced to lowest minimum cost.
6. Complete fans are systematically designed, compact, neat appearing, with no awkward, cumbersome or superfluous parts.
7. Guaranteed assurance as to customer's future satisfaction.
8. Guarantee of fan and motor by one company.
9. Highest efficiency obtainable and low power consumption.
10. Quietness of operation, neatness in appearance and ease of installation.

Autovent Fan & Blower Co.

"Dept. H"

730-738 W. Monroe St., Chicago, Ill.

REGISTERED AUTOVENT

new 32-story building being erected by S. W. Straus & Co., which is to be 475 ft. in height, under the provisions of the new zoning ordinance, will not be in violation of the restrictions of the old building code which prohibited a greater height than 400 ft. This ruling, it is believed, will remove indefinitely the ban on high office buildings in Chicago. Only one building previously has exceded 400 ft. in height, the Chicago Temple, which reaches 556 ft. skyward. That building was constructed under a special ordinance granted because of the inspirational nature of the building's tower.

Engineering Division of the Industrial Department of New York State reported that plans presented to it for construction work on industrial buildings outside Greater New York, called for expenditures of nearly $3,000,000, an amount greater than for any other month this year and also greater than any month in 1921. Of this amount more than $2,700,000 was for new factory buildings.

Boston, Mass.—Heating a house with automobile crank-case oil that is periodically drawn off and thrown away may prove an aid in solving the fuel problem, if experiments now being conducted here are successful. It is conservatively estimated 15,000,000 quarts of this oil are used and thrown away annually in Massachusetts.

Washington, D. C.—The White House at Washington, D. C. is being connected with the steam heating system of the State Department building. Col. Clarence Sherrill, chief military aid to the President, who also has charge of all government buildings and grounds, discovered that the State Department was generating not only enough steam for its building but also enough to heat the White House. Accordingly the change was made.

Eastern Supply Association, at its annual meeting at the Hotel Astor, New York, October 10, was stirred by an address by Colonel W. G. Archer, special field representative of the National Trade Extension Bureau, who held the attention of his audience for a full hour while he spoke on "Sanitation and Civilization." W. Randolph Montgomery, chief counsel of the National Association of Credit Men, made an interesting address on "Bankruptcy

—To The Man Who is Interested In More Heat for Less Money ···

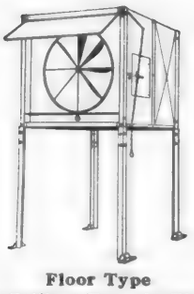
Ford Tractor Plant, Detroit, Michigan

When a mammoth organization like the Ford Tractor Plant makes three installations of ILGAIR Unit Heaters totaling 54 units, it represents an endorsement of one of this country's foremost Industrial plant engineers.

A Valuable Book *for* Architects and Heating Engineers

Showing How to Keep the Heat Circulating at the Floor Level

Sent on Request



Floor Type
Note Ceiling Type in Picture

HIGH EFFICIENCY ILG VENTILATING MACHINERY

Ventilation

FOR OFFICES · STORES · FACTORIES · PUBLIC BUILDINGS · RESTAURANTS · THEATRES · HOUSES · ETC ·

ILG ELECTRIC VENTILATING CO. 2858 NORTH CRAWFORD AVE. CHICAGO

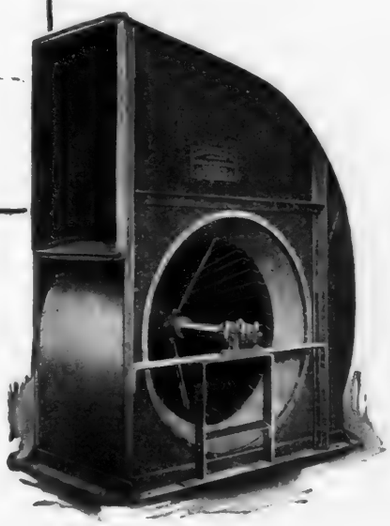
BRANCHES IN ALL PRINCIPAL CITIES

Fans and Carrier Air Washers
Used in Hudson Bay Co.
Store at Victoria

"Buffalo"

THE Winter's wind that drifted snow over the trail of the "Voyageur" is tamed for the use of science —and warms the modern store of the old H. B. C.

Ax' heem de nort' win' w'at he see
Of de Voyageur long ago,
An' he'll say to you w'at he say to me.
So lissen hees story well—
"I see de track of hees botte sau-vage
On many a hill an' long portage
Far, far away from hees own village
An' soun' of de parish bell."
—*Drummond.*



Our Engineers and Catalogs are Waiting to Serve You

BUFFALO FORGE COMPANY

480 BROADWAY . . BUFFALO, N. Y.

Abuses and the Remedy." "Problems of Management" were discussed by Howard Coonley, president of the Walworth Mfg. Co., of Boston. The movement to standardize catalogue sizes was advanced by the appointment of a committee of three to work with the National Trade Extension Bureau in furthering this work. The officers elected at the meeting are: President, Frank W. Hubbard, Boston; first vice-president, George E. Keenan; second vice-president, Phillip J. Flaherty; treasurer, Martin Behrer; secretary, Frank S. Hanley. Board of directors: Willard Chamberlin, James A. Messer, John A. Murray, Leo O'Neil, R. A. Tate, A. A. Tomlinson and J. Forsythe Sheppard.

National Safety Council, at its Twelfth Annual Safety Congress in Buffalo, October 1-5, elected as its president L. A. DeBlois, of the E. I. duPont de Nemours & Co., of Wilmington, Del. The newly-elected vice-president in charge of general activities is C. B. Auel, of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Chicago, Ill.—Dr. H. N. Bundesen, health commissioner, is sponsor for a proposed amendment to the Chicago heat ordinance which would require that landlords furnish heat to their tenants whenever the thermometer registers lower than 55° F.

Central Supply Association held its twenty-ninth annual meeting in Chicago, October 3-4, at the Drake Hotel, with the largest attendance in its history. Among the principal speakers were President H. E. Bryam of the Chicago, Milwaukee and St. Paul Railway, who spoke on "Transportation"; John B. Malling, of New Haven, Ind., whose subject was "Freak and Class Legislation," and Ex-Congressman Adam Bede of Minnesota, who discussed current events in a witty manner. William J. Woolley, secretary-manager of the National Trade Extension Bureau, told of the progress that has been made in the campaign for the training of apprentices in the heating and plumbing trades and urged the importance of a continued interest in the subject in order to meet the crying demand for more skilled workmen. The following officers were elected: President, M. J. O'Fallan, Denver, Colo.; first vice-president, F. R. Dengel, Milwaukee, Wis.; second vice-president, J. D. Tschopik, Pittsburgh, Pa.; treasurer, Edward F. Niedecken, Milwaukee, Wis.; secretary, Paul Blatchford, Chicago, Ill.; assistant secretary, Charles L. Blatchford, Chicago.

It was voted that the February meeting be held in Chicago, at the Drake, the dates being February 19 and 20, 1924.

G. A. Chaffee, who is retiring as manager of the Minneapolis branch of Crane Company, after a service of 35 years, was tendered a luncheon by his associates and members of the Twin Cities Jobbers, in Minneapolis, October 12. Among the speakers were M. M. Cochran, of the Cochran-Sargent Co.; P. J. Frey, of the Central Supply Co.; and P. R. Mork, Mr. Chaffee's successor.

Heating and Ventilating Engineering Study Courses by mail are announced by the A-Em-Dee Engineering Co., 3166 18th St., N. W., Washington, D. C. which has in preparation what it terms "theo-practical" home study courses in heating and ventilating engineering. The courses offered at present are Course HA on gravity warm-air heating and Course HB on gravity water and steam heating. Other courses, it is stated, are in preparation which will go fully into all branches of heating and ventilating. A. M. Daniels is at the head of the enterprise.

Manufacturers' Notes

Lebanon Machine Co., Inc., Lebanon, N. H. has appointed Arthur J. Deschamps, 56 Mulberry St., Hartford, Conn., with Frank E. Wilder, M. E., as its sales representatives for Connecticut.

Walworth Manufacturing Co., Boston, Mass., recently declared a quarterly dividend of 35¢ on common and 75¢ on the preferred stock, the former payable September 15 to stock of record September 5 and the latter September 29 to stock of record September 19.

Monitor Boiler Co., Lancaster, Pa., has announced the appointment of C. F. Bachler & Son, 139 North Fourth St., Philadelphia, as sales agents for its products in Philadelphia and vicinity and the southern part of New Jersey, including Atlantic City, Wildwood and Cape May.

PUBLIC SCHOOL No. 62, BRONX, New York City, N. Y.
Over one Hundred Lehigh Fans are installed in New York City Schools
Engineers—New York Board of Education.
Contractors—Federal Heating Co., New York City

LEHIGH MULTIBLADE FANS

FOR HEATING AND VENTILATING

WHERE large volumes of air are to be handled at comparatively low pressures such as in heating and ventilating systems LEHIGH Multiblade Fans are guaranteed to be equal to, if not superior, to any other fans on the market.

HERSH BROTHERS CO.

654 Mill Street **ALLENTOWN, PA.**

Arthur Loomis Harmon, *Architect*
Jaros & Baum, *Engineers*
Gillis & Geoghegan, *Contractors*

THE SHELTON HOTEL CLUB

is Sturtevant heated and ventilated. The apparatus includes sixteen Multivane Fans and 2268 square feet of heating surface. The fans provide constant air change, to every nook and corner of the building, by delivering 202,700 cubic feet of fresh air per minute.

Sturtevant engineers worked in close coöperation with those who created and built this beautiful structure. Counsel from these engineers has been present on hundreds of other similar undertakings. Consequently many architects and engineers know the benefits accruing from such contact. It is a tangible factor always at your command.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Sales Engineering Offices:
Atlanta, Ga.
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Dallas, Texas
Detroit, Mich.
Hartford, Conn.
Indianapolis, Ind.
Los Angeles, Cal.
Minneapolis, Minn.

Plants Located in
Hyde Park, Mass.
Sturtevant, Wis.
Berkeley, Cal.
Framingham, Mass.
Philadelphia, Pa.
Galt, Ontario

Sales Engineering Offices:
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Rochester, N. Y.
St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Seattle, Wash.
Springfield, Mass.
Washington, D. C.

Sturtevant
PUTS AIR TO WORK

745

Chicago Nipple Manufacturing Co., Chicago, Ill., has declared a dividend of 20 cents on the A stock, payable October 1. The regular rate is 15 cents, the extra five cents being applied to reduce accumulation of dividends, which now amounts to $1.15 a share.

Atmospheric Conditioning Corporation, Philadelphia, Pa., has appointed M. G. Harbula manager of its New York office at 149 Broadway. Mr. Harbula first became identified with the Webster air conditioning apparatus ten years ago and since that time has been engaged in the design, manufacture and installation of this type of equipment.

Utica Heater Co., Utica, N. Y., has moved its New York office to larger quarters in Suite 1843, Grand Central Terminal building. H. R. Dillon and R. W. Devereaux are in charge.

Lebanon Machine Co., Inc., Lebanon, N. H. has made the following appointments as sales representatives: Tomlinson Steam Specialty Co., Cleveland, O., and Detroit, Mich., northern half of Ohio and entire state of Michigan; Oscar C. Anderson, Chicago, to cover Chicago and Milwaukee; Lucien L. Carr, eastern Nebraska and western Iowa; Joseph G. Walsh, Kansas City, Mo., Kansas City agent; J. G. & Rushby Midgley, Salt Lake City, Utah, to cover that city; Hulting, Hurst & Hulting, San Francisco, to cover that city; and Jesse B. Royalty, El Paso, Tex., northeastern Texas and southern New Mexico.

W. A. Russell & Co., New York, has appointed James D. Erskine sales manager for the company.

H. A. Thrush & Co., Peru, Ind., manufacturers of water heating systems, has named Louis W. Bonsib as sales manager. Mr. Bonsib, who has been manager of the service department of the Indianapolis Engraving Co., has been handling the Thrush company's advertising for several years. The company has recently added two factory units and plans are under way for further expansion.

National Radiator Co., New Castle, Pa., has completed the construction of a new foundry and core room at its plant in New Castle. The addition increases the capacity of the plant 20%.

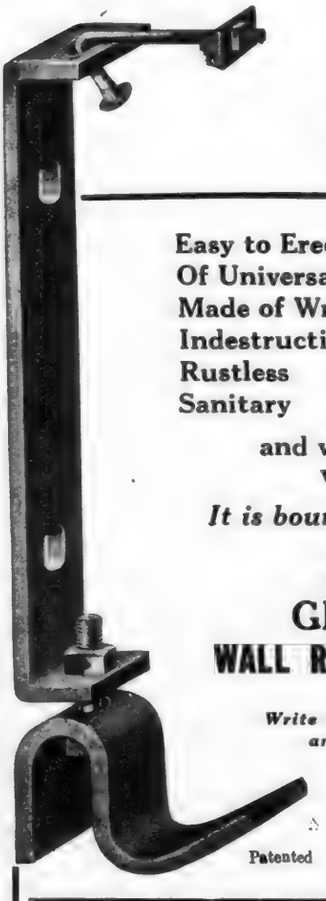
Honeywell Heating Specialties Co., Wabash, Ind., which suffered a fire loss October 5, when sparks from the factory chimney started a conflagration damaging the upper story of its plant where inflammable packing materials were stored, reports that the loss of stock and building will not exceed $25,000 and is fully covered by insurance. Very little completed stock was destroyed and shipments were delayed only for a few days. Although hourly inspections of the plant were the rule at the time of the fire, the flames were not discovered until one end of the fourth floor of the main building was in flames. The night and day shifts were changing at the time and the full night and day force, together with the city fire department, by heroic efforts, kept the flames confined to the fourth floor of the building. The roof of the main part of the factory was completely destroyed, as well as rough stock stored on the fourth floor. More than 100 men were immediately put to work clearing away the debris and by the next night the building was ready for the carpenters. Canvas was provided to cover the entire building as a protection against rain, and every department was again in operation by October 12.

Construction Specialties Co., Rochester, N. Y., upper New York State distributor of the products of the Marsh Valve Co., Dunkirk, N. Y., has opened a branch office in Buffalo, N. Y., in the new Jackson Building, on Delaware Avenue. E. D. Curtis, formerly of the Western Electric Company, is in charge of the Buffalo and Niagara Falls interests of the Marsh Valve Co.

EverHot Heater Co., Detroit, Mich., has increased its capital stock from $50,000 to $200,000. The company manufactures the EverHot water heater.

Excelso Specialty Works, Buffalo, N. Y., has purchased the business of the Phaeton Heater Co., in Peekskill, N. Y.

Crane Co., Chicago, Ill., is opening a branch distributing house in Greenville, S. C., with P. F. Sackett in charge.



When a Bracket is

Easy to Erect
Of Universal Adjustment
Made of Wrought Iron
Indestructible
Rustless
Sanitary

and will fit any make wall radiator

It is bound to be Economical and Ideal

SUCH IS THE

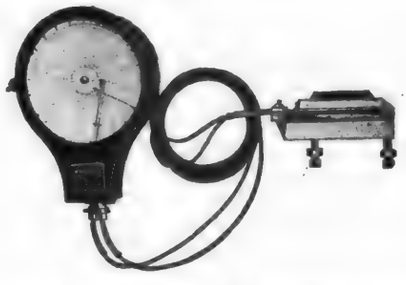
GLEOCKLE
WALL RADIATOR BRACKET

Write for Descriptive Booklet and Trade Discounts

Prompt Shipments

Patented **A. F. GLEOCKLE, Jr.**
415 Bay St., Rochester, N. Y.

Specifying "Gleockle" Brackets is one way of saving your client money



RELATIVE HUMIDITY

Perhaps you may have the very best humidifying equipment. But, how do you know it is always functioning correctly unless you have some means of checking the accuracy? The answer is--

TRADE MARK
BRISTOL'S
REG.U.S.PAT. OFFICE

Recording Wet and Dry Bulb Thermometer

With this equipment you can know the relative humidity for any hour of the day or night. The initial expense is not big and the maintenance almost nothing.

Bulletin N-311 devoted exclusively to Bristol's Humidity Recorders. Shall we send you a copy?

THE BRISTOL COMPANY
WATERBURY, CONN.

Boston New York Philadelphia Pittsburgh Detroit
Chicago St. Louis San Francisco

The Logical Man to Lay Out the Heating Plant–The Heating Engineer

He Alone Should Have Control of Air Infiltration

When an architect hands a set of building plans to a heating contractor with instructions to lay out the heating plant, he invites, for the owner, the continuous expense of maintaining a cheap job laid out by guess-work. For the heating contractor, seeking naturally to submit the lowest bid in order to get the job—and with no investment in the heating installation and no responsibility for its success—grasps every opportunity to reduce labor and material costs.

Contrast his position with that of the heating engineer. The latter, knowing that he must bear the responsibility for satisfactory heating at the lowest cost for radiation, brings to bear the latest data developed by research to design his work. He insists that each and every sash around windows and doors shall be fitted exactly the same. His choice of weather strips is made to offset the swelling and shrinking of the woodwork and to effectively control air infiltration.

Like the architect, the heating engineer has nothing but his professional knowledge and experience to sell, and his recommendations are made with the success of the heating installation foremost in mind.

We are recommending that architects omit weather strips from the general specifications and put the control of air infiltration where it belongs—in the hands of the heating engineer.

We will be glad to send you our "Table of b. t. u. losses through air infiltration around windows and doors" upon receipt of your request.

MONARCH METAL PRODUCTS CO.

5060 Penrose St. St. Louis, Mo.

MONARCH METAL WEATHER STRIPS

Standard Control of Air Infiltration

New Firms

Universal Pipe & Radiator Co., New York, is the name of the recognized Iron Products Corporation and its subsidiaries, which include the Central Foundry Co., Central Iron & Coal Co., Central Radiator Co., Essex Foundry, Chattanooga Iron & Coal Co., Molby Boiler Co., and the Central Foundry Co., of New Jersey.

Walter E. Gillham, of Kansas City, Mo., announces that Benjamin F. Cook and W. Emery White, both of whom have been associated with him for a number of years in his consulting engineering work, are now members of the firm which will hereafter be known as Gillham, Cook & White. The firm's offices are at 409 Interstate Building.

Contracts Awarded

Tindle Plumbing & Heating Co., Akron, O., heating and ventilating Central High school building, for $33,830.

M. Desmond Manufacturing Co., Edwardsville, Ill., heating and plumbing of the new Edwardsville High school building for $38,911.

O'Fry Heating & Plumbing Co., Macon, Ga., heating the new boys' High school building at Macon, for $17,743.87.

James A. Hill, Los Angeles, Calif., ventilating system for the Second Street tunnel, for $5,849.99.

John Shontlemire, Findlay, O., heating and plumbing for annex to Central High school, for $52,033.62.

Hampton Metal & Plumbing Co., Vernon, Tex., heating and plumbing for new Electra, Tex., school building, for $20,586.50.

Brady & Co., East Moline, Ia., heating three additions to intermediate schools in Davenport, Ia., for $25,600.

Monroe City, Mo.—The following bids were received for heating the new Monroe City High school building: C. L. Johnson, Monroe City, $9,245; Eichler Co., St. Louis, $9,387; Bristow & Longmire, Monroe City, $9,909; Edwards & Co., St. Louis, $10,447; Conley & Son, Shelbina, Mo., $10,711.72; Best Bros., Quincy, $11,477; Elliott Barry Construction Co., St. Louis, $11,550; and Sodemann Co., St. Louis, $11,927.

A. Shuler & Sons Co., Hamilton, O., was the low bidder for heating and ventilating new High school gymnasium, for $10,914.

William Boyce, Grinnel, Ia., heating and plumbing for the Children's Hospital, for $30,000.

Council Bluffs, Ia.—The following bids were received for heating the new Bloomer school building: B. Grunewald, Inc., $25,619; Joe Hansen, $26,689; Robert Parks Heating & Plumbing Co., $27,000; New York Plumbing Co., $27,484; Joseph M. Buggee, $27,848; John A. Anderson Co., $28,337; and Steffan Bros., $29,692.

Johnson & Joslin, Terre Haute, Ind., heating and ventilating public auditorium in Terre Haute, Ind., for $6,800. R. A. Koerher is the architect. The auditorium is to be built near the Three-I ball park.

Davenport, Ia.—Bids were received as follows for the heating and ventilating of two grade school buildings in Davenport: Ideal Heating & Construction Co., Davenport, Ia., $15,927; Ryan Plumbing & Heating Co., Davenport, $15,819.

New Corporations

Bloomfield Heating, Plumbing & Electric Co., Bloomfield, Iowa, capital $10,000. Officers: C. E. Fry, president; F. V. Leon, vice-president; and E. S. Stockham, secretary and treasurer.

Stark Heating Co., Denver, Colo., capital $25,000. Incorporators: Shady R. Jones, Adrienne Jones and Wallace W. Keene.

Lyons Products Co., 213 Austin Ave., Chicago, Ill., capital $10,000. Incorporators: Frank Mellish, Charles H. Touzalin, Eugene G. Melin. The company will manufacture heating devices. Correspondent, Ernest W. Clark, 11 S. LaSalle St., Chicago.

Grove Plumbing & Heating Co., 1606 East 71st Street, Chicago, Ill., capital $5,000. Incorporators: J. H. Blackwell, O. G. Jenner, and Emma Blackwell McFadden. Correspondent, Frisch & Frisch, 6 North Clark St.

Gordon's Valve Shop, Inc., Framingham, Mass., has been incorporated with a capital of $15,000 for the manufacture of valves and fittings. Incorporators: Robert Gordon, Maxwell Gordon and David Lasker.

YOU KNOW THAT A *GOOD* OLD IDEA IS INFINITELY BETTER THAN A *POOR* NEW ONE

Patented

So in suggesting the importance of absolutely dependable

MUSHROOM VENTILATORS

we are glad to plead guilty to telling you nothing new

But if we can get close enough to your organization we can show you something unusual

We can show you MUSHROOM VENTILATORS that are standardized for excellence and never vary from their standard.

SERVICE and QUALITY

first and last tested for fifteen years by the most prominent Architects and Heating and Ventilating Engineers in the largest and finest Theatre, Church and School Auditoriums in America.

That is the thing that may interest you in the House of Knowles.

KNOWLES MUSHROOM VENTILATOR CO.

202 Franklin Street New York

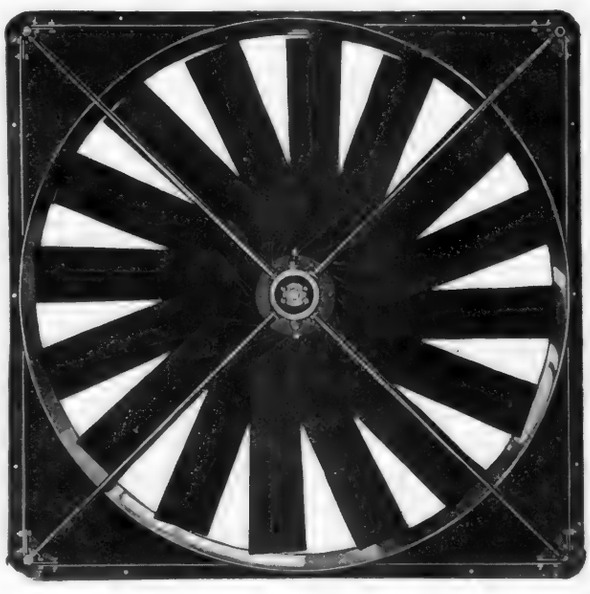
JAMES M. SEYMOUR

Established 1888

Lawrence St., Mechanic St. and Kirk Place

NEWARK NEW JERSEY

PROPELLER TYPE FANS



SEND for BULLETINS, PRICES and DISCOUNTS

Simplicity and Economy in Ventilation

From the architects layout to the installation and operation of the Buckeye Heatovent simplicity marks every detail.

The Buckeye Heatovent, unit system of heating and ventilating, permits you to regulate the ventilation of each room separately, just as you regulate its temperature. When a room is occupied press a small button on the Heatovent and a measured volume of warm fresh air, heated to room temperature is diffused throughout the room. When the room is vacated press a button and ventilation stops.

That is why the Heatovent unit system of heating and ventilating is more economical in operation than a central fan system—the entire building need not be ventilated unless occupied.

The Heatovent may be installed in an old building, too. If at any time the building is dismantled the salvage value of the Heatovent is nearly one hundred per cent. They may be re-installed in any building.

Write to our nearest branch office for any information that you may desire about the Heatovent. Our engineers will gladly co-operate with you.

BUCKEYE BLOWER COMPANY

COLUMBUS, OHIO

BRANCH SALES AND ENGINEERING OFFICES:

Case and Morse, 1018 4th Ave. So., Seattle, Wash.
324 Monadnock Bldg., Chicago, Ill.
216½ N. 21st St., Birmingham, Ala.
503 Wabash Bldg., Pittsburgh, Pa.
1400 Broadway, New York
Builders' Exchange Bldg., Baltimore, Md.
372 Whitehall St., Atlanta, Ga.

Business Chances

Waukegan, Ill.—An improvement representing an expenditure between $350,000 and $400,000 is being planned by the Crooker interests in the form of a group of business dwellings to be erected on their property north of the First Baptist Church on Genesee Street. Two distinct plans are being considered, one calling for a building to contain ten stores, and the other for a building 7—D—Heat & Vent —1364 —Curtin in the form of an arcade. Both plans call for a central heating plant.

Seattle, Wash.—Plans for an additional unit to the Metropolitan Building Company's group of buildings are being prepared by Howells & Albertson, architects, and President J. F. Douglas of the Metropolitan Building Company. The proposed building will be a six-story fireproof structure to be built for the specific use of doctors and dentists. The estimated cost is $750,000. It is stated that the architects, in their plans, will embody many new ventilating ideas to dispose of the odors from chemicals, etc.

Detroit, Mich.—New docks for the Detroit & Cleveland Navigation Company are being planned for Detroit, to accomodate the steamers Greater Detroit and Greater Buffalo which are being built by the company and which will be the largest and most palatial fresh water liners in the world. The new docks will be built at the foot of Cass Avenue, until recently occupied by the warehouses and docks of Bühl Sons Company.

Detroit, Mich.—Buhl Land Company announces that the present Buhl Building, at Congress and Griswold Streets, is about to be razed and a new building erected on its site, to be 26 stories high and to cost $5,000,000. It will be constructed in the shape of a cross. Erection of the new building is expected to provide a big stimulus to building in lower Griswold Street and the old financial district of the city. The present Buhl Building, with its large offices and old-fashioned fireplaces, one in each room, is a curiosity among Detroit office buildings.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, until November 21, 1923, for the construction of the U. S. Post Office and Court House building 100 x 99 ft., two stories and basement, at Steubenville, O.

Washington, D. C.—Sealed proposals will be received at the office of Supervising Architect, Treasury Department until November 20, 1923, for the construction, including mechanical equipment, of the U. S. Post Office at Central City, Neb., a one-story and part basement building approximately 60 x 47 ft. with brick walls and non-fireproof interior.

Report of Illinois Legislative Committee on Chicago Building Trades

The report of the committee, appointed by the Illinois General Assembly in March, 1921, to investigate the building situation in Chicago, has been made public. The committee found its task a most difficult one, the report stating that "witnesses were intimidated by threat not merely of injury to person and property, and of discharge from employment, boycott, ostracism, and isolation, but also of the loss of their very lives."

As a result of the investigation the report states: "forty convictions have followed against bombers, conspirators, jury bribers and perjurers, in connection with crimes, most of which arose directly or indirectly out of the building situation. There are awaiting trial in the State courts 218 defendants, and in the Federal courts 297 corporation and individual defendants, charged with crimes affecting the building industry."

The report throws much light on agreements existing between contractors, material men and the unions. Instances of such agreements are cited in the report as affecting the following trades: carpenters, steamfitters, plasterers, and sheet metal work.

Tycos

TEMPERATURE INSTRUMENTS
INDICATING - RECORDING - CONTROLLING

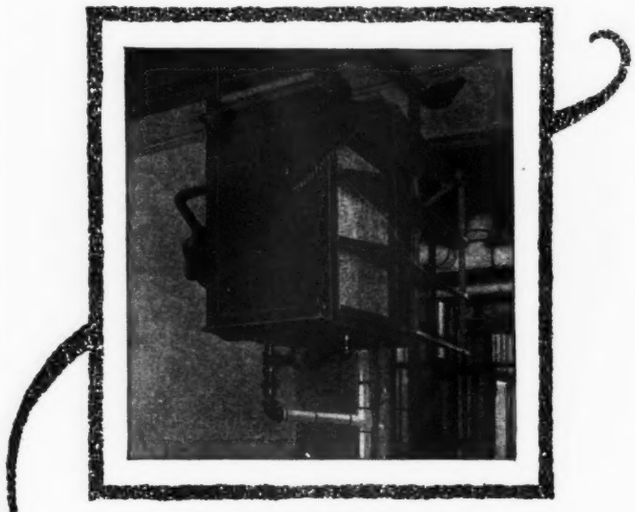
Steam or Hot Water

temperatures maintained by means of *Tycos* Temperature Instruments. *Tycos* Recorders give continuous records of outgoing and return steam or hot water temperatures. Effects economy in coal and labor.

Be sure that you get *Tycos*.

Tycos catalogs are made for men who want information at their finger tips. Write today.

Taylor Instrument Companies
ROCHESTER N.Y.
There's a Tycos or Taylor Temperature Instrument for Every Purpose

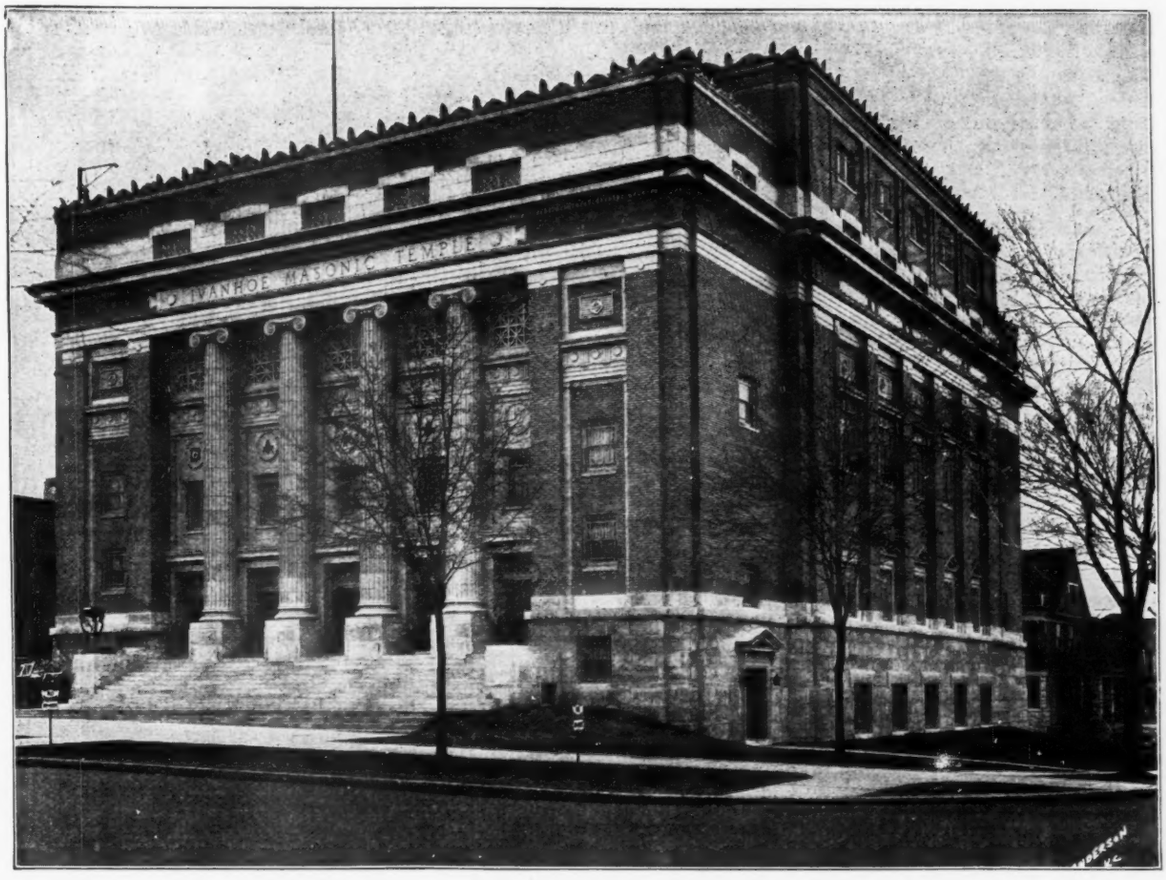


Six Small Bolts Support this Wing Heater

You can attach this Wing Featherweight Unit Heater to the roof or ceiling beams, columns or walls by six small bolts. Make one or two steam and electric connections and it is ready to operate. It will supply the working levels of the plant with an active circulation of heated air, free from drafts, low temperature areas and hot spots. Ask us to send complete data and specifications on particular installations.

L. J. Wing Mfg. Co.

Fans and Blowers *Damper Regulators*
Unit Heaters *Small Turbines*
Hudson & 13th Sts. **NEW YORK**



IVANHOE MASONIC TEMPLE
KANSAS CITY, MO.

SMITH, REA & LOVITT, *Architects*
Kansas City, Mo.

MAGILL PLUMBING & HEATING CO., *Contractors*
Kansas City, Mo.

THIS BUILDING IS VENTILATED
By

SERI-VANE FANS

For heating and ventilating equipment from the simplest to the most complex, write

THE NEW YORK BLOWER COMPANY

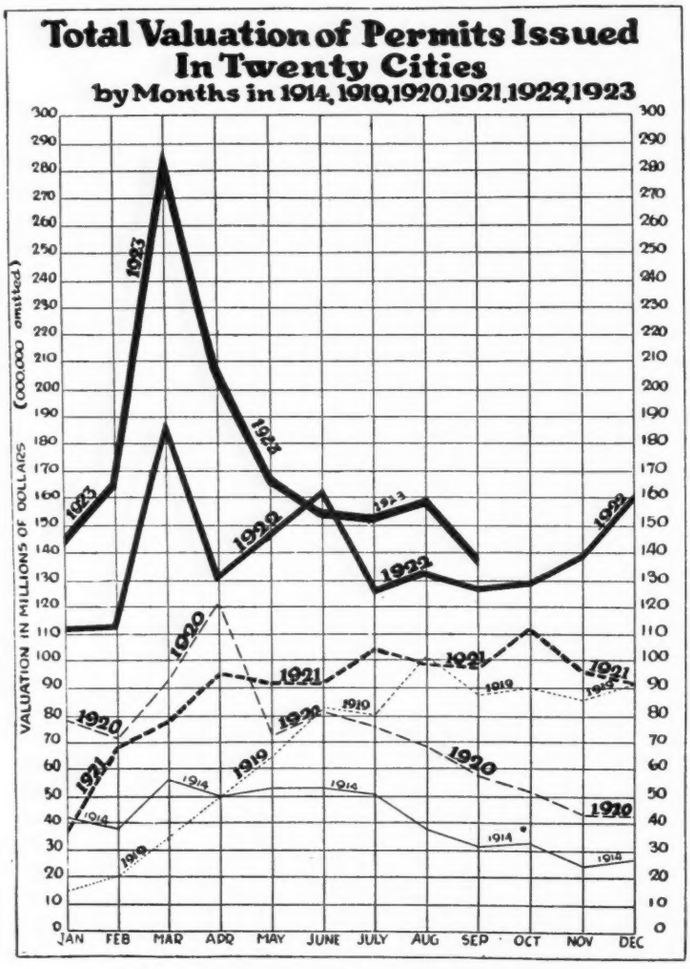
2248 S. Halsted Street
CHICAGO, ILLINOIS

Factory: LaPorte, Indiana. **Branch offices in principal cities.**

Our engineers are prepared to give expert advice on cooling, evaporating and conveying systems

WRITE FOR CATALOGS

"The evidence shows" the report states "that the operation of the arrangement (in the carpenter trade) resulted in a practical monopoly in favor of the Chicago manufacturers of millwork to the exclusion of practically all outside materials. Consequently the Chicago manufacturers have dictated the price for their product, and, as a result, it has arisen approximately 200% within the past three years.


Total Valuation of Permits Issued In Twenty Cities
by Months in 1914, 1919, 1920, 1921, 1922, 1923
VALUATION IN MILLIONS OF DOLLARS (000,000 omitted)
JAN FEB MAR APR MAY JUNE JULY AUG SEP OCT NOV DEC
1923
1922
1921
1920
1919
1914

Six Years of Building Construction.

"The millwork of the factories of Wisconsin and Iowa, which previous to June 1, 1918, found a ready market in Chicago has been almost completely excluded."

Most of the agreements discovered by the committee had two-fold purposes, the report says, first to unionize the particular trade affected, and, secondly, to assure Chicago contractors practically the entire Chicago business to the exclusion of products manufactured elsewhere, regardless of price.

Six Years of Building Construction.

An idea of what we are experiencing in the present building situation, as compared with the past four years and with 1914, may be had from the accompanying charts compiled by *The American Contractor*. The twenty cities which are used in making up the totals for the chart are New York, Chicago, Philadelphia, Boston, Pittsburgh, Detroit, Los Angeles, Baltimore, San Francisco, Cleveland, Seattle, Minneapolis, Kansas City, St. Louis, Dallas, New Orleans, Indianapolis, Milwaukee, Buffalo and Atlanta.

Illness of Frank K. Chew.

The news that Frank K. Chew, editor of *Sheet Metal Worker*, was in the New York Hospital, suffering from enlargement of the heart, came as a shock to his host of friends in the heating and ventilating, plumbing and sheet-metal industries. After a period of several weeks, Mr. Chew's condition had sufficiently improved so that he could be removed to the home of his brother in Morristown, N. J.

The latest advices as to his condition are that while recovery may be slow, the good wishes of his friends will be realized in his eventual restoration to health.

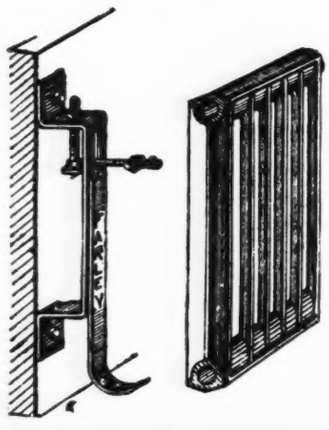
WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

ENGINEER WANTED — Heating and ventilating engineer for a well-established concern in Cleveland. Must be experienced and able to properly estimate and close contracts. A fine opportunity for one who can qualify and who can furnish A1 references. Address Box 111, care of Heating and Ventilating Magazine.

WANTED — Mechanical engineer, single, for heating, ventilating and power house work. One with cotton mill experience preferred. Give education, experience and salary desired. Address Atwood & Nash, Inc., architects and engineers, Durham, N. C.

FOR SALE—1 Sturtevant plate fan 100-in. RHTH, direct-connected, 5 x 8 Sturtevant engine; 1 Sturtevant plate fan, 140-in. RHTH; 1 propeller wall fan, diam. 49 in., Howard & Morse; 2 No. 5 Serivane multiblade fans, New York Blower Co., RHTH; 2 No. 5 Serivane multiblade fans, LHVU. Eastman Kodak Co., Rochester, N. Y.



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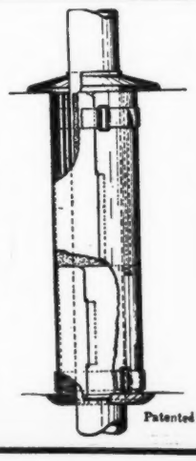

Send for descriptive literature

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